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Krafttransformatorer – Transformatorer för omriktardrift – Del 1: Transformatorer för industribruk

*Converter transformers –
Part 1: Transformers for industrial applications*

Som svensk standard gäller europastandarden EN 61378-1:2011. Den svenska standarden innehåller den officiella engelska språkversionen av EN 61378-1:2011.

Nationellt förord

Europastandarden EN 61378-1:2011

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English version

**Convertor transformers -
Part 1: Transformers for industrial applications
(IEC 61378-1:2011)**

Transformateurs de conversion -
Partie 1: Transformateurs pour
applications industrielles
(CEI 61378-1:2011)

Stromrichtertransformatoren -
Teil 1: Transformatoren für industrielle
Anwendungen
(IEC 61378-1:2011)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

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

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Foreword

The text of document 14/686/FDIS, future edition 2 of IEC 61378-1, prepared by IEC/TC 14, "Power transformers", was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61378-1:2011.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2012-05-30
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2014-08-30

This document supersedes EN 61378-1:1998 + corr. Nov.1998.

EN 61378-1:2011 includes the following significant technical changes with respect to EN 61378-1:1998 + corr. Nov.1998:

- addition of winding connections (zig-zag, extended delta, etc.) with phase displacement ($<30^\circ$);
- addition of transformers with more than one active part in the same tank;
- change of reference power definition (it is now based on fundamental component of the current);
- addition of considerations for guidelines for OLTC selection;
- addition of regulating transformer feeding converter transformer;
- addition of considerations about current sharing and hot spot temperature in high current windings for various winding arrangements;
- addition of transducers used for d.c. voltage regulation together with diode rectifiers;
- improved old annexes with several calculation examples;
- addition of new annexes for special measurements setups.

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

Endorsement notice

The text of the International Standard IEC 61378-1:2011 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60076-4:2002	NOTE Harmonized as EN 60076-4:2002 (not modified).
IEC 60076-5:2006	NOTE Harmonized as EN 60076-5:2006 (not modified).
IEC 60076-10:2001	NOTE Harmonized as EN 60076-10:2001 (not modified).
IEC 60146-1-3:1991	NOTE Harmonized as EN 60146-1-3:1993 (not modified).
IEC 61378-2:2001	NOTE Harmonized as EN 61378-2:2001 (not modified).

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050-421	1990	International electrotechnical vocabulary (IEV) - Chapter 421: Power transformers and reactors	-	-
IEC 60076	Series	Power transformers	EN 60076	Series
IEC 60076-1	2011	Power transformers - Part 1: General	EN 60076-1	2011
IEC 60076-2	2011	Power transformers - Part 2: Temperature rise for liquid-immersed transformers	EN 60076-2	2011
IEC 60076-3 + corr. December	2000 2000	Power transformers - Part 3: Insulation levels, dielectric tests and external clearances in air	EN 60076-3	2001
IEC 60076-6	2007	Power transformers - Part 6: Reactors	EN 60076-6	2008
IEC 60076-8	1997	Power transformers - Part 8: Application guide	-	-
IEC 60076-11	2004	Power transformers - Part 11: Dry-type transformers	EN 60076-11	2004
IEC 60146	Series	Semiconductor converters - General requirements and line commutated converters	EN 60146	Series
IEC 60146-1-1	2009	Semiconductor converters - General requirements and line commutated converters - Part 1-1: Specification of basic requirements	EN 60146-1-1	2010
IEC/TR 60146-1-2	2011	Semiconductor converters - General requirements and line commutated converters - Part 1-2: Application guide	-	-
IEC/TR 60616	1978	Terminal and tapping markings for power transformers	-	-

CONTENTS

1	Scope	8
2	Normative references.....	9
3	Terms, definitions and acronyms.....	9
3.1	Terms and definitions	9
3.2	Acronyms	10
4	Classification	11
4.1	General	11
4.2	Normal service conditions	11
4.3	Provision for unusual service conditions.....	12
5	Ratings.....	12
5.1	General	12
5.2	Rated power at rated frequency and load capability	12
5.3	Rated and service voltages	13
5.3.1	Transformer energized from an a.c. power system	13
5.3.2	Transformer energized from a converter/inverter with or without variable frequency	13
5.4	Rated current	13
5.5	Phase displacement and terminal identification for three-phase transformer	13
5.6	Rating plate	14
5.7	Units with tertiary windings loaded with filter and compensation.....	14
5.8	On load tap-changers	15
6	Load loss and voltage drop in transformers and reactors	15
6.1	General	15
6.2	Determination of transformer load loss under distorted current loading	15
6.3	Current sharing, losses and hot spot in high current windings.....	19
6.4	Effect of geometrical winding arrangement and magnetic coupling between windings on their eddy current losses due to harmonics in transformers with three or more windings wound on the same core limb	20
6.5	Losses in interphase transformers, current-balancing reactors, series- smoothing reactors and transductors	26
6.5.1	General	26
6.5.2	Interphase transformers.....	26
6.5.3	Current-balancing reactors.....	26
6.5.4	Series-smoothing reactors	26
6.5.5	Transductors	26
6.6	Voltage drops in transformers and reactors	27
6.6.1	General	27
6.6.2	Transductors	28
7	Tests for converter transformers	29
7.1	General	29
7.2	Measurement of commutating reactance and determination of the inductive voltage drop	30
7.2.1	Commutating reactance	30
7.2.2	Inductive voltage regulation.....	30
7.3	Measurement of voltage ratio and phase displacement.....	31
7.4	Dielectric tests.....	31

7.4.1	General	31
7.4.2	Dielectric test between interleaved valve windings	31
7.5	Load loss test	32
7.5.1	General	32
7.5.2	Load loss measurement in rectifier transformers with transducers in the same tank	32
7.5.3	Test bus bars configuration for short circuit of high current valve windings	32
7.6	Temperature rise tests	32
7.6.1	General	32
7.6.2	Total loss injection	33
7.6.3	Rated load loss injection	33
7.6.4	Test of temperature rise on dry-type transformers	35
8	On load noise level with transducers and/or IPT	35
Annex A (informative)	Determination of transformer service load loss at rated non-sinusoidal converter current from measurements with rated transformer current of fundamental frequency.....	38
Annex B (informative)	Short-circuit test currents and load losses in transformers for single-way converters (total loss injection)	56
Annex C (informative)	Current sharing measurement in high current valve windings.....	57
Annex D (informative)	Examples of duty cycles.....	66
Annex E (informative)	Guidelines for design review	67
Annex F (informative)	Determination of loss in transformer tank due to magnetic field. 3D simulation and guidelines for tank losses evaluation and tank hotspot calculation	70
Annex G (informative)	Short-circuit measurements of rectifier transformers equipped with built in transducers	71
Annex H (informative)	Determination of the transformer voltage ratio and phase displacement by the turn ratio measurements.....	73
Annex I (informative)	Phase displacement connections and terminal indications of converter transformers.....	78
Annex J (normative)	Correlation between IEC 61378-1 and IEC 60146-1-1 ratings	83
	Bibliography	90
	Figure 1 – B6U or DB 6 pulse double bridge connection.....	10
	Figure 2 – DSS 6 pulse connection.....	11
	Figure 3 – Leakage fields for a three-winding transformer with closely coupled valve windings.....	22
	Figure 4 – Leakage fields for a three-winding transformer with decoupled valve windings.....	23
	Figure 5 – Leakage fields for a three winding transformer with loosely coupled double concentric valve windings	24
	Figure 6 – Leakage fields for a three winding transformer with loosely coupled double-tier valve windings.....	25
	Figure 7 – Typical transducer regulating curve (with max voltage drop at zero control current) and tolerance band	28
	Figure A.1 – Cross-section of a winding strand	40
	Figure A.2 – Terminal identification for winding connection Y y0y6	43
	Figure A.3 – Terminal identification for winding connection D d0y1	46

Figure A.4 – Valve current DB connection rectangular shape positive shape	47
Figure A.5 – Valve current DB connection rectangular shape positive and negative shape.....	48
Figure A.6 – Valve current DSS connection rectangular shape	52
Figure C.1 – Example of valve high current winding and measurement equipment disposition	58
Figure C.2 – Transformer windings arrangement	59
Figure C.3 – Measurement circuit for the in-phase measurement.....	60
Figure C.4 – Measurement circuit for the in-opposition measurement.....	61
Figure C.5 – Measurements and comparison with the simulations made by finite element method software for the in-phase current distribution.....	63
Figure C.6 – Measurements and comparison with the simulations made by finite element method software for the in-opposition current distribution	65
Figure H.1 – Yd1 connection	74
Figure H.2 – Yd11 connection	74
Figure H.3 – Pd0+7,5 connection.....	75
Figure H.4 – Oscilloscope connection.....	76
Figure H.5 – Oscilloscope with phase B + 7,5° lag referring to phase A.....	76
Figure H.6 – Oscilloscope with phase B – 7,5° lead referring to phase A.....	77
Figure I.1 – Counterclockwise phase displacement.....	78
Figure I.2 – Yd11 connection.....	78
Figure I.3 – Yd1 connection.....	78
Figure I.4 – Example I.1 phase displacement.....	79
Figure I.5 – Example I.2 phase displacement.....	79
Figure J.1 – DB connection ideal rectangular current blocks	83
Figure J.2 – DSS Connection rectangular current blocks.....	84
Table 1 – Connections and calculation factors	36
Table A.1 – Specified harmonic currents and phase displacement in the valve windings.....	41
Table A.2 – Resistance measurements at 20 °C winding temperature	42
Table A.3 – Specified harmonic currents and phase displacement in the line and valve windings.....	45
Table A.4 – Measurements from test report	46
Table A.5 – Resulting current harmonics	48
Table A.6 – Resulting current harmonics	49
Table A.7 – Resulting current harmonics	50
Table A.8 – Detailed transformer load losses at rated tap position, with tertiary unloaded.....	51
Table A.9 – Resulting current harmonics	52
Table A.10 – Specified harmonic currents and phase displacement in the line and valve windings.....	53
Table A.11 – Resulting current harmonics	54
Table A.12 – Detailed transformer load losses at rated tap position, with tertiary unloaded.....	55
Table C.1 – Measurements and comparison with the simulations made by finite element method software for the in-phase current distribution.....	62

Table C.2 – Measurements and comparison with the simulations made by finite element method software for the in-opposition current distribution	64
Table D.1 – Examples of duty cycles for different applications	66
Table H.1 – Single phase ratio measurements	73
Table J.1 – Harmonics content up to 25 th in DB 6 pulse connection (ideal rectangular current waveshape).....	84
Table J.2 – Harmonics content up to 25 th in DSS 6 pulse connection (ideal rectangular current waveshape).....	85
Table J.3 – Calculation factor comparison example	86
Table J.4 – Calculation factor comparison general factors	87

CONVERTER TRANSFORMERS –

Part 1: Transformers for industrial applications

1 Scope

This Part of IEC 61378 deals with the specification, design and testing of power transformers and reactors which are intended for integration within semiconductor converter plants; it is not applicable to transformers designed for industrial or public distribution of a.c. power in general.

The scope of this International Standard is limited to application of power converters of any power rating. Typical applications are: thyristor rectifiers for electrolysis; diode rectifiers for electrolysis; thyristor rectifiers for large drives; thyristor rectifiers for scrap melting furnaces, and diode rectifiers feeding inverters for variable speed drives. The standard also covers the regulating unit utilized in such application as step down regulating transformers or autotransformers. The valve winding highest voltage for equipment is limited to 36 kV.

This standard is not applicable to transformers for HVDC power transmission. These are high-voltage transformers, and they are subjected to d.c. voltage tests.

The standards for the complete converter plant (IEC 60146 series, or other publications dedicated to particular fields of application) may contain requirements of guarantees and tests (such as insulation and power loss) for the whole plant, including the converter transformer and possibly auxiliary transformers and reactor equipment. This does not relieve the application of the requirements of this standard concerning the guarantees and tests applicable to the converter transformer itself as a separate component before being assembled with the remainder of the converter plant.

The guarantees, service and type tests defined in this standard apply equally to transformers supplied as part of an overall converter package, or to those transformers ordered separately but for use with converter equipment. Any supplementary guarantee or special verification has to be specifically agreed in the transformer contract.

The converter transformers covered by this standard may be of the oil-immersed or dry-type design. Unless specific exceptions are stated in this standard, the transformers comply with IEC 60076 series for oil-immersed transformers, and with IEC 60076-11 for dry-type transformers.

NOTE For some converter applications, it is possible to use common distribution transformers of standard design. The use of such standard transformers in the special converter applications may require a certain derating. This matter is not specifically covered in this standard, which deals with the requirements to be placed on specially designed units. It is possible to estimate this derating from the formulae given in 5.1, and also from Clause 9 of IEC 60076-8:1997.

This standard deals with transformers with one or more active parts installed in the same tank like regulating (auto)transformer and one or two rectifier transformers. It also covers transformers with transducers and/or one or more interphase transformers.

For any combination not listed above an agreement between the purchaser and manufacturer is necessary regarding the determination and the measurement of the total losses.

This standard deals with transformers star Y and delta D and any other phase shifting connections (like zig-zag, extended delta, polygon etc.). Phase shifting windings can be placed on either the regulating or rectifier transformer.

2 Normative references

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

IEC 60050-421:1990, *International Electrotechnical Vocabulary (IEV) – Chapter 421: Power transformers and reactors*

IEC 60076 (all parts), *Power transformers*

IEC 60076-1:2011, *Power transformers – Part 1: General*

IEC 60076-2:2011, *Power transformers – Part 2: Temperature rise for liquid-immersed transformers*

IEC 60076-3:2000, *Power transformers – Part 3: Insulation levels, dielectric tests and external clearances in air*

IEC 60076-6:2007, *Power transformers – Part 6: Reactors*

IEC 60076-8:1997, *Power transformers – Part 8: Application guide*

IEC 60076-11:2004, *Power transformers – Part 11: Dry-type transformers*

IEC 60146 (all parts), *Semiconductor converters – General requirements and line commutated converters*

IEC 60146-1-1:2009, *Semiconductor converters – General requirements and line commutated converters – Part 1-1: Specifications of basic requirements*

IEC/TR 60146-1-2:2011, *Semiconductor converters – General requirements and line commutated converters – Part 1-2: Application guide*

IEC/TR 60616:1978, *Terminal and tapping markings for power transformers*