

Australian/New Zealand Standard™

Power transformers

Part 6: Reactors



AS/NZS 60076.6:2013

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Australian/New Zealand Standard™

Power transformers

Part 6: Reactors

Originated as AS 1028—1970.
Previous edition 1992.
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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL-008, Power Transformers, to supersede AS 1028—1992, *Power reactors and earthing transformers*.

The objective of this Standard is to provide designers, suppliers, purchasers and users of reactors with requirements that apply to the specification, testing and application of various types of reactors.

This Standard is identical with, and has been reproduced from, IEC 60076-6, Ed. 1.0 (2007), *Power transformers, Part 6: Reactors*.

The previous edition, AS 1028—1992, was an adoption with national modifications of IEC 60289, Ed. 2.0 (1988), *Reactors*. IEC 60076-6, Ed. 1.0 (2007) is a technical revision of IEC 60289, Ed. 2.0 (1998), and includes the following significant changes:

- (a) Wide extension of the ‘definitions’, ‘rating’ and ‘tests’ clauses.
- (b) More consequent distinction between definition and rating.
- (c) ‘Tests’ clauses take into account the latest revisions of relevant IEC 60076 standards.
- (d) Dielectric testing of reactors is now in accordance with the dielectric testing of transformers in AS/NZS 60076.3:2008.
- (e) Consequent distinction between oil-immersed and dry-type reactors.
- (f) Document offers easier handling and is more of a stand-alone document.
- (g) Introduction of the discharge reactor as part of Clause 9.
- (h) Introduction of the turn-to-turn overvoltage test for dry-type reactors (Annex E).
- (i) Important background information given by the following newly introduced informative annexes:
 - (i) Annex A—Information on shunt reactor switching and on special applications.
 - (ii) Annex B—Magnetic characteristic of reactors.
 - (iii) Annex C—Mutual reactance, coupling factor and equivalent reactances of three-phase reactors.
 - (iv) Annex D—Temperature correction of losses for liquid-immersed gapped-core and magnetically-shielded air-core reactors.
 - (v) Annex F—Short-circuit testing.
 - (vi) Annex G—Resistors—Characteristics, specification and tests.

As this Standard is reproduced from an International Standard, the following applies:

- (A) In the source text ‘this part of IEC 60076’ should read ‘this Australian/New Zealand Standard’.
- (B) A full point should be substituted for a comma when referring to a decimal marker.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the annex to which they apply. A ‘normative’ annex is an integral part of a Standard, whereas an ‘informative’ annex is only for information and guidance.

References to International Standards should be replaced by references to Australian or Australian/New Zealand Standards, as follows:

<i>Reference to International Standard</i>		<i>Australian/New Zealand Standard</i>	
IEC		AS/NZS	
60076	Power transformers	60076	Power transformers
60076-1	Part 1: General	60076.1	Part 1: General (IEC 60076-1, Ed. 2.1 (2000) MOD)
60076-2	Part 2: Temperature rise for liquid-immersed transformers	60076.2	Part 2: Temperature rise for liquid-immersed transformers (IEC 60076-2, Ed. 3.0 (2011) MOD)
60076-3	Part 3: Insulation levels, dielectric tests and external clearances in air	60076.3	Part 3: Insulation levels, dielectric tests and external clearances in air (IEC 60076-3, Ed. 2 (2000) MOD)
		AS	
60076-4	Part 4: Guide to the lightning impulse and switching impulse testing—Power transformers and reactors	60076.4	Part 4: Guide to the lightning impulse and switching impulse testing—Power transformers and reactors
		AS/NZS	
60076-5	Part 5: Ability to withstand short circuit	60076.5	Part 5: Ability to withstand short circuit (IEC 60076-5, Ed. 3.0 (2006) MOD)
60076-7	Part 7: Loading guide for oil-immersed power transformers	60076.7	Part 7: Loading guide for oil-immersed power transformers (IEC 60076-7, Ed. 1.0 (2005) MOD)
		AS	
60076-8	Part 8: Application guide	2374	Power transformers
		2374.8	Part 8: Application guide
		AS/NZS	
60076-10	Part 10: Determination of sound levels	60076.10	Part 10: Determination of sound levels
		AS	
60076-11	Part 11: Dry-type transformers	60076.11	Part 11: Dry-type transformers
		AS/NZS	
60137	Insulated bushings for alternating voltages above 1 000 V	60137	Insulated bushings for alternating voltages above 1 000 V (IEC 60137, Ed. 5.0 (2003) MOD)
		AS	
60270	High-voltage test techniques—Partial discharge measurements	60270	High-voltage test techniques—Partial discharge measurements

Only international references that have been adopted as Australian or Australian/New Zealand Standards have been listed.

CONTENTS

1	Scope	12
2	Normative references	12
3	Terms and definitions	13
3.1	Types of reactor	13
3.2	Other definitions	14
4	Symbols and abbreviations	17
5	Service conditions	18
5.1	General	18
5.2	Seismic conditions	18
6	Design, testing, tolerances and application	18
7	Shunt reactors	20
7.1	General	20
7.2	Design	20
7.3	Terms and definitions	20
7.4	Rating	21
7.4.1	Rated voltage	22
7.4.2	Maximum operating voltage	22
7.4.3	Rated power	22
7.4.4	Zero-sequence reactance of a three-phase star-connected reactor	22
7.4.5	Mutual reactance of a three-phase reactor	22
7.4.6	Inrush current level	22
7.4.7	Linearity of the shunt reactor	22
7.5	Temperature rise	22
7.6	Insulation level	23
7.7	Rating plates	23
7.8	Tests	23
7.8.1	General	23
7.8.2	Routine tests	23
7.8.3	Type tests	24
7.8.4	Special tests	24
7.8.5	Determination of reactance and linearity of reactance	24
7.8.6	Measurement of loss (routine test, special test)	25
7.8.7	Measurement of harmonics of the current (special test)	26
7.8.8	Measurement of zero-sequence reactance on three-phase reactors (special test)	27
7.8.9	Measurement of mutual reactance on three-phase reactors (special test)	27
7.8.10	Dielectric tests	27
7.8.11	Measurement of magnetic characteristic (special test)	30
7.8.12	Measurement of acoustic sound level (type test, special test)	30
7.8.13	Measurement of vibration (type test)	31
7.8.14	Temperature rise test (type test)	32
7.9	Tolerances	33

7.9.1	General	33
7.9.2	Tolerances on reactance at rated voltage and rated frequency	33
7.9.3	Tolerances on the linearity of reactance	33
7.9.4	Tolerance on loss	33
8	Current-limiting reactors and neutral-earthing reactors	33
8.1	General	33
8.2	Design.....	34
8.3	Terms and definitions	34
8.4	Rating	36
8.4.1	Rated continuous current.....	36
8.4.2	Rated thermal short-circuit current.....	37
8.4.3	Rated thermal short-circuit current duration	37
8.4.4	Rated mechanical short-circuit current.....	37
8.4.5	Rated short-time current.....	37
8.4.6	Rated short-time current duration or duty-cycle	37
8.4.7	Coupling factor	38
8.4.8	Rated short-circuit impedance	38
8.4.9	Rated short-time impedance	39
8.4.10	Rated continuous impedance.....	39
8.5	Ability to withstand rated thermal and rated mechanical short-circuit current	39
8.6	Temperature rise.....	39
8.6.1	Temperature rise at rated continuous current	39
8.6.2	Temperature due to rated thermal short-circuit current and rated short-time current loading.....	40
8.7	Insulation level	40
8.7.1	General	40
8.8	Rating plates	40
8.9	Tests.....	41
8.9.1	General	41
8.9.2	Routine tests	41
8.9.3	Type tests	41
8.9.4	Special tests.....	42
8.9.5	Measurement of impedance at rated continuous current (routine test)	42
8.9.6	Measurement of impedance at rated short-time current (routine test).....	43
8.9.7	Measurement of loss (routine test, special test).....	43
8.9.8	Separate source a.c. withstand voltage test (routine test, special test).....	44
8.9.9	Winding overvoltage test for current-limiting reactors (routine test).....	44
8.9.10	Winding overvoltage test for neutral-earthing reactors (routine test)	45
8.9.11	Temperature rise test at rated continuous current (type test)	45
8.9.12	Lightning impulse test for current-limiting reactors (type test)	46
8.9.13	Short-circuit current test (special test)	46
8.9.14	Measurement of acoustic sound level at rated continuous current (special test).....	47
8.9.15	Vibration measurement at rated continuous current (special test)	47
8.9.16	Switching impulse test (special test)	48
8.9.17	Double-ended lightning impulse test (special test)	48
8.9.18	Measurement of coupling factor (special test).....	49
8.9.19	Wet winding overvoltage test (special test)	49

8.9.20	Wet separate source a.c. withstand voltage test (special test)	49
8.9.21	Measurement of reactance of the winding in the case of gapped-core and magnetically-shielded air-core reactors (special test)	49
8.10	Tolerances	50
8.10.1	Tolerance on impedances of reactors without compensation for mutual coupling	50
8.10.2	Tolerance on impedance of reactors with compensation for mutual coupling.....	50
8.10.3	Tolerance on loss	50
9	Filter, damping and discharge reactors associated with capacitors	50
9.1	General	50
9.2	Design.....	51
9.3	Terms and definitions	51
9.4	Rating	53
9.4.1	Rated power frequency current.....	53
9.4.2	Rated current spectrum	53
9.4.3	Rated inrush current.....	54
9.4.4	Rated inrush frequency.....	54
9.4.5	Rated discharge current	54
9.4.6	Rated discharge frequency	54
9.4.7	Rated thermal short-circuit current.....	54
9.4.8	Rated thermal short-circuit current duration	54
9.4.9	Rated mechanical short-circuit current.....	55
9.4.10	Rated inductance.....	55
9.4.11	Quality factor	55
9.5	Ability to withstand rated thermal and rated mechanical short-circuit current	55
9.6	Ability to withstand inrush or discharge current.....	56
9.7	Temperature rise	56
9.7.1	Temperature rise at equivalent current at power frequency.....	56
9.7.2	Temperature due to rated thermal short-circuit current loading	56
9.8	Insulation level	56
9.8.1	General	56
9.8.2	Insulation requirements	56
9.9	Rating plates	57
9.10	Tests.....	57
9.10.1	General	57
9.10.2	Routine tests	58
9.10.3	Type tests	58
9.10.4	Special tests	58
9.10.5	Measurement of inductance (routine test, type test)	58
9.10.6	Measurement of loss and quality factor (routine test, type test)	59
9.10.7	Winding overvoltage test (routine test)	59
9.10.8	Temperature rise test at rated continuous current (type test).....	60
9.10.9	Lightning impulse test (type test).....	60
9.10.10	Short-circuit current test (special test).....	60
9.10.11	Measurement of acoustic sound level at rated continuous current (special test)	61
9.10.12	Separate source a.c. withstand voltage test (special test)	62
9.10.13	Inrush current withstand test (special test)	62
9.10.14	Discharge current test (special test)	63

9.10.15	Modified short-circuit/discharge current test (special test)	63
9.10.16	Mechanical resonance test (special test)	63
9.11	Tolerances	63
9.11.1	Tolerance on rated inductance	63
9.11.2	Tolerance on measured loss and quality factor	63
10	Earthing transformers (neutral couplers).....	63
10.1	General.....	63
10.2	Design.....	64
10.3	Terms and definitions	64
10.4	Rating	66
10.4.1	Rated voltage	66
10.4.2	Maximum operating voltage	66
10.4.3	Rated zero-sequence impedance.....	66
10.4.4	Rated continuous neutral current.....	66
10.4.5	Rated short-time neutral current	67
10.4.6	Rated short-time neutral current duration.....	67
10.4.7	Rated voltage of the secondary winding.....	67
10.4.8	Further ratings for the combination of an earthing transformer and an arc-suppression reactor.....	67
10.5	Ability to withstand the rated short-time neutral current	67
10.6	Temperature rise.....	68
10.6.1	Temperature rise at rated voltage, rated continuous neutral current and rated power of the secondary winding.....	68
10.6.2	Temperature after rated short-time neutral current loading	68
10.7	Insulation level	68
10.8	Rating plates	68
10.9	Tests.....	69
10.9.1	General.....	69
10.9.2	Routine tests.....	69
10.9.3	Type tests	70
10.9.4	Special tests	70
10.9.5	Measurement of zero-sequence impedance (routine test).....	70
10.9.6	Temperature rise test (type test)	71
10.9.7	Dielectric tests (routine test, type test)	72
10.9.8	Demonstration of ability to withstand rated short-time neutral current (special test)	72
10.9.9	Measurement of loss at rated continuous neutral current (special test)	73
10.9.10	Measurement of neutral current with three-phase excitation under single-phase fault condition (type test)	73
10.10	Tolerances	73
11	Arc-suppression reactors.....	74
11.1	General.....	74
11.2	Design.....	74
11.3	Terms and definitions	74
11.4	Rating	75
11.4.1	Rated voltage	75
11.4.2	Maximum continuous voltage.....	75
11.4.3	Rated current	75
11.4.4	Rated current duration.....	76

11.4.5	Adjustment range	76
11.4.6	Auxiliary winding	76
11.4.7	Secondary winding	76
11.4.8	Linearity of the arc-suppression reactor	76
11.5	Temperature rise	76
11.6	Insulation level	77
11.7	Rating plates	77
11.8	Tests	77
11.8.1	General	77
11.8.2	Routine tests	78
11.8.3	Type tests	78
11.8.4	Special tests	78
11.8.5	Measurement of current at rated voltage (type test), measurement of current (routine test)	78
11.8.6	Measurement of no-load voltage of the auxiliary and secondary windings (routine test)	78
11.8.7	Temperature rise test (type test)	79
11.8.8	Dielectric tests (routine test, type test)	79
11.8.9	Measurement of loss (special test)	79
11.8.10	Measurement of linearity (special test)	80
11.8.11	Measurement of acoustic sound level (special test)	80
11.8.12	Endurance tests of the inductance regulation mechanism (special test)	80
11.8.13	Demonstration of ability to withstand the dynamic effects of the rated current (special test)	80
11.9	Tolerances	81
12	Smoothing reactors	81
12.1	General	81
12.2	Design	81
12.3	Terms and definitions	81
12.4	Rating	82
12.4.1	Rated voltage	82
12.4.2	Maximum operating voltage	82
12.4.3	Rated continuous direct current	83
12.4.4	Rated continuous current spectrum	83
12.4.5	Short-time overload current, current spectrum and current duration or duty-cycle	83
12.4.6	Rated transient fault current	83
12.4.7	Rated incremental inductance	83
12.4.8	Linearity of the smoothing reactor	83
12.4.9	Additional requirements for reactors with directly liquid cooled windings	83
12.5	Temperature rise	84
12.6	Insulation levels	84
12.6.1	Lightning impulse levels	84
12.6.2	Switching impulse levels	84
12.6.3	Separate source d.c. withstand voltage level	84
12.6.4	Polarity-reversal withstand voltage level	84
12.6.5	Separate source a.c. withstand voltage level	84
12.7	Rating plates	85

12.8 Tests	85
12.8.1 General	85
12.8.2 Routine tests	85
12.8.3 Type test	86
12.8.4 Special tests	86
12.8.5 Measurement of incremental inductance (routine test)	86
12.8.6 Measurement of the harmonic current loss and calculation of the total loss (routine test)	87
12.8.7 Separate source a.c. withstand voltage test (routine test)	88
12.8.8 Separate source d.c. withstand voltage test for liquid-immersed reactors (routine test)	88
12.8.9 Polarity-reversal withstand test for liquid-immersed reactors (routine test)	89
12.8.10 Lightning impulse test (routine test)	90
12.8.11 Switching impulse test (routine test, type test)	90
12.8.12 Wet separate source d.c. withstand voltage test for dry-type reactors (type test)	90
12.8.13 Temperature rise test (type test)	90
12.8.14 Measurement of acoustic sound level (special test)	91
12.8.15 Measurement of high frequency impedance (special test)	92
12.8.16 Test of the tightness of the liquid cooling circuit for reactors with directly liquid cooled windings (routine test)	92
12.8.17 Measurement of the pressure drop for reactors with directly liquid cooled windings (type test)	93
12.8.18 Transient fault current test (special test)	93
12.8.19 Chopped wave impulse test for liquid-immersed reactors (special test)	94
12.9 Tolerances	94
 Annex A (informative) Information on shunt reactor switching and on special applications	 95
Annex B (informative) Magnetic characteristic of reactors	98
Annex C (informative) Mutual reactance, coupling factor and equivalent reactances of three-phase reactors	105
Annex D (informative) Temperature correction of losses for liquid-immersed gapped-core and magnetically-shielded air-core reactors	108
Annex E (normative) Turn-to-turn overvoltage test for dry-type reactors	110
Annex F (informative) Short-circuit testing	112
Annex G (informative) Resistors – Characteristics, specification and tests	114
 Bibliography	 117
 Figure 1 – Types of magnetic characteristics for reactors	 15
Figure 2 – Parameters for non-linear magnetic characteristic	16
Figure 3 – Measurement of mutual reactance for three-phase reactors or banks of three single-phase reactors	27
Figure 4 – Phase-to-earth test circuit for single-phase excitation	29
Figure 5 – Phase-to-phase test circuit for single-phase excitation	29

Figure 6 – Single-phase excitation circuit for reactors with magnetic shield for zero-sequence flux	29
Figure 7 – Measurement of mutual reactance for three-phase reactors or banks of three single-phase reactors	49
Figure 8 – Single-phase fault test circuit with earthed neutral	73
Figure 9 – Single-phase fault test circuit with earthed voltage-supply.....	73
Figure 10 – Measuring circuit for determining incremental inductance of two identical smoothing reactors	87
Figure 11 – Double reversal test voltage profile	89
Figure B.1 – Illustration of linked flux and current waveshapes with a sinusoidal voltage applied to a reactor with a non-linear magnetic characteristic according to Figure B.6.....	99
Figure B.2 – Circuit for measurement the magnetic characteristic according to B.7.1	102
Figure B.3 – Equivalent circuit with the reactor short-circuited	102
Figure B.4 – Measured curves of a reactors d.c. charge and discharge current.....	103
Figure B.5 – Calculated linked flux during discharge period (see equations B7 and B9)	104
Figure B.6 – Magnetic characteristic	104
Figure C.1 – Equivalent scheme of a three-phase reactor including the magnetic coupling between phases.....	105
Figure E.1 – Test circuit for turn-to-turn overvoltage test and sample oscillograms	111
Table 1 – Temperature limits for winding terminals of dry-type reactors	19
Table 2 – Tolerances	74
Table 3 – Tolerances	81
Table C.1 – Reactance and flux ratios for reactors with uniform magnetic coupling.....	106
Table C.2 – Coupling values for reactors with non-uniform magnetic coupling	107

INTRODUCTION

Wherever possible, references to technical Clauses in the other parts of IEC 60076 which are relevant to power transformers have been made. However, because reactors have some fundamental differences to transformers there are special considerations that apply to the specification, testing and application of reactors. These are included in this part of IEC 60076.

Clauses 1 to 6 form the general parts of the document, which apply to all types of reactor. Clauses 7 to 12 deal individually with each different type of reactor. Generally, only one of the Clauses 7 to 12 will apply to a specific reactor.

This part of IEC 60076 has more than one definition Subclause. The general definitions given in Clause 3 apply to the whole document. Each of the Clauses 7 to 12 dealing with a certain type of reactor includes a definition Subclause relevant and applying only to that Clause.

Clauses 7 to 12 have been given a uniform structure. Within this structure, the Rating Subclause sets out the minimum information that a purchaser shall supply with the reactor specification. The test Subclause in each Clause defines the relevant tests that can be applied to that particular type of reactor and may include some additional items that shall be agreed on at the time of order.

Annexes A, B, C, D, F and G provide further information for certain reactor applications and testing. Annex E describes the dielectric turn-to-turn test.

This part of IEC 60076 covers both dry-type and liquid-immersed reactors and where Clauses or Subclauses apply to only one type this is made clear.

Where possible, the requirements of this part of IEC 60076 have been harmonised with the equivalent IEEE standard.

AUSTRALIAN/NEW ZEALAND STANDARD

Power transformers**Part 6:
Reactors****1 Scope**

This part of IEC 60076 applies to the following types of reactors:

- shunt reactors;
- series reactors including current-limiting reactors, neutral-earthing reactors, power flow control reactors, motor starting reactors, arc-furnace series reactors;
- filter (tuning) reactors;
- capacitor damping reactors;
- capacitor discharge reactors;
- earthing transformers (neutral couplers);
- arc-suppression reactors;
- smoothing reactors for HVDC and industrial application;

with the exception of the following reactors:

- reactors with a rating less than 1 kvar single-phase and 5 kvar three-phase;
- reactors for special purposes such as high-frequency line traps or reactors mounted on rolling stock.

Where IEC standards do not exist for small or special reactors, this part of IEC 60076 may be applicable as a whole or in part.

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 60060-1:1989, *High-Voltage test techniques – Part 1: General definitions and test requirements*

IEC 60076-1:1993, *Power transformers – Part 1: General*
Amendment 1 (1999)

IEC 60076-2:1997, *Power transformers – Part 2: Temperature rise*

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

IEC 60076-4:2002, *Power transformers – Part 4: Guide to lightning impulse and switching impulse testing – Power transformers and reactors*

IEC 60076-5:2006, *Power transformers – Part 5: Ability to withstand short-circuit*