

Australian/New Zealand Standard™

Low-voltage switchgear and controlgear

**Part 6.2: Multiple function equipment—
Control and protective switching
devices (or equipment)(CPS)**



Standards Australia



STANDARDS
NEW ZEALAND
Pūrongo Aotearoa

AS/NZS 3947.6.2:2001

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee EL-006, Industrial Switchgear and Controlgear. It was approved on behalf of the Council of Standards Australia on 2 February 2001 and on behalf of the Council of Standards New Zealand on 27 April 2001. It was published on 5 May 2001.

The following interests are represented on Committee EL-006:

Australasian Railway Association
Australian Chamber of Commerce and Industry
Australian Electrical and Electronic Manufacturers Association
Bureau of Steel Manufacturers of Australia
Electrical Contractors Association of New Zealand
Electricity Supply Association of Australia
Independent Electrical Switchboard Manufacturers Association
Institution of Engineers Australia
Ministry of Economic Development New Zealand
National Electrical and Communications Association
Testing Interests (Australia)
WorkCover N. S. W.

Keeping Standards up-to-date

Standards are living documents which reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued. Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments which may have been published since the Standard was purchased.

Detailed information about joint Australian/New Zealand Standards can be found by visiting the Standards Australia web site at www.standards.com.au or Standards New Zealand web site at www.standards.co.nz and looking up the relevant Standard in the on-line catalogue.

Alternatively, both organizations publish an annual printed Catalogue with full details of all current Standards. For more frequent listings or notification of revisions, amendments and withdrawals, Standards Australia and Standards New Zealand offer a number of update options. For information about these services, users should contact their respective national Standards organization.

We also welcome suggestions for improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Please address your comments to the Chief Executive of either Standards Australia International or Standards New Zealand at the address shown on the back cover.

Australian/New Zealand Standard™

Low-voltage switchgear and controlgear

**Part 6.2: Multiple function equipment—
Control and protective switching
devices (or equipment)(CPS)**

Originated as AS 3947.6.2—1996.
Jointly revised and designated AS/NZS 3947.6.2:2001.

COPYRIGHT

© Standards Australia/Standards New Zealand

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher.

Jointly published by Standards Australia International Ltd, GPO Box 5420, Sydney, NSW 2001 and Standards New Zealand, Private Bag 2439, Wellington 6020

ISBN 0 7337 3784 6

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL-006, Industrial Switchgear and Controlgear to supersede AS 3947.6.2—1996.

The objective of this Standard is to provide characteristics of CPSs, the conditions with which they shall comply, the tests to verify that these conditions have been met and the information to be marked or given with the CPSs.

This Standard is Part 6.2 of a series which, when complete, will consist of the following:

AS/(NZS) 3947	Low-voltage switchgear and controlgear
AS/NZS 3947.1	Part 1: General rules
AS 3947.2	Part 2: Circuit-breakers
AS/NZS 3947.3	Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units
AS/NZS 3947.3 Suppl	Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units Supplement 1: Fuse-switch-disconnectors and switch-disconnectors for use with low-voltage aerial bundled cables
AS/NZS 3947.4.1	Part 4.1: Contactors and motor-starters—Electromechanical contactors and motor-starters
AS/NZS 3947.4.2	Part 4.2: Contactors and motor-starters—A.C. semiconductor motor controllers and starters
AS/NZS 3947.4.3	Part 4.3: Contactors and motor-starters—A.C. semiconductor controllers and contactors for non-motor loads
AS/NZS 3947.5.1	Part 5.1: Control circuit devices and switching elements—Electromechanical control circuit devices
AS/NZS 3947.5.2	Part 5.2: Control circuit devices and switching elements—Proximity switches
AS/NZS 3947.5.3	Part 5.3: Control circuit devices and switching elements—Requirements for proximity devices with defined behaviour under fault conditions
AS/NZS 3947.5.4	Part 5.4: Control circuit devices and switching elements—Methods of assessing the performance of low-energy contacts—Special tests
AS/NZS 3947.5.5	Part 5.5: Control circuit devices and switching elements—Electrical emergency stop devices with mechanical latching function
AS/NZS 3947.5.6	Part 5.6: Control circuit devices and switching elements—D.C. interface for proximity sensors and switching amplifiers (NAMUR)
AS/NZS 3947.6.1	Part 6.1: Multiple function equipment—Automatic transfer switching equipment
AS/NZS 3947.6.2	Part 6.2: Multiple function equipment—Control and protective switching devices (or equipment) (CPS) (This Standard)
AS/NZS 3947.7.1	Part 7.1: Ancillary equipment—Terminal blocks for copper conductors
AS 3947.7.2	Part 7.2: Ancillary equipment—Protective conductor terminal blocks for copper conductors
AS/NZS 3947.7.3	Part 7.3: Ancillary equipment—Safety requirements for terminal blocks for the reception of cartridge fuse-links

This Standard is identical with and has been reproduced from IEC 60947-6-2 consolidated Edition 1-2:1999, which incorporates Amendment 1:1997 and Amendment 2:1998 into IEC 60947-6-2:1992, *Low-voltage switchgear and controlgear—Part 6-2: Multiple function equipment—Control and Protective Switching Devices (or equipment) (CPS)*.

The provisions of AS/NZS 3947.1 are applicable to this Standard, where specifically called for. Clauses and subclauses thus applicable, as well as tables, figures, and annexes are identified by reference to IEC 60947-1, for example subclause 1.2.3 of IEC 60947-1, table 4 of IEC 60947-1 or annex A of IEC 60947-1.

This Standard differs from AS 3947.6.2—1996 by the adoption of IEC Amendments 1:1997 and 2:1998 which add appropriate IEC Standards, new requirements for electromagnetic compatibility (EMC) and modify performance requirements and tests.

A vertical line in the margin shows where the base publication has been modified by Amendments 1 and 2.

A reference to an International Standard identified in the Normative References Clause by strikethrough (~~example~~) is replaced by a reference to the Australian or Australian/New Zealand Standard(s) listed immediately thereafter and identified by shading (~~example~~). Where the struck-through referenced document and the referenced Australian or Australian/New Zealand Standard are identical, this is indicated in parenthesis after the title of the latter.

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

- (a) Its number does not appear on each page of text and its identity is shown only on the cover and title page.
- (b) In the source text ‘this standard’ should read ‘this Australian/New Zealand Standard’.
- (c) 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.

CONTENTS

	<i>Page</i>
1	Scope and object.....1
2	Normative references1
3	Definitions3
3.1	Control and protective switching device (or equipment) (CPS).....3
3.2	CPS suitable for isolation3
3.3	CPS for motor control and protection.....3
3.3.1	Direct-on-line CPS.....3
3.3.2	Reversing CPS3
3.3.3	Two-direction CPS.....3
3.4	Opening time.....3
3.5	Phase loss sensitive relay or release (for motor protection).....4
4	Classification.....4
5	Characteristics4
5.1	Summary of characteristics4
5.2	Type of CPS.....4
5.2.1	Number of poles4
5.2.2	Kind of current (a.c. or d.c.).....4
5.2.3	Method of operation.....4
5.2.4	Method of control.....4
5.2.5	Method of resetting after overload4
5.2.6	Method of rearming after short-circuit5
5.3	Rated and limiting values of the main circuit.....5
5.3.1	Rated voltages5
5.3.2	Currents and powers5
5.3.3	Rated frequency5
5.3.4	Rated duties5
5.3.5	Normal load and overload characteristics5
5.3.6	Short circuit characteristics.....6
5.4	Utilization categories6
5.4.1	Standard utilization categories.....6
5.4.2	Assignment of utilization categories based on the results of tests7
5.4.3	Application of utilization categories for motor control duty.....8
5.5	Control circuits8
5.6	Auxiliary circuits8
5.7	Relays or releases.....9
5.7.1	Types of relays or releases.....9
5.7.2	Characteristic values9

	<i>Page</i>
5.7.3	Designation and current setting of overload relays or releases 10
5.7.4	Time current characteristics of over current relays or releases 10
5.7.5	Influence of ambient air temperature 10
5.8	Switching overvoltages 10
6	Product information 10
6.1	Nature of information 10
6.1.1	Identification 10
6.1.2	Characteristics 11
6.2	Marking 11
6.3	Instructions for installation, operation and maintenance 12
7	Normal service, mounting and transport conditions 12
8	Constructional and performance requirements 12
8.1	Constructional requirements 12
8.1.1	Materials 12
8.1.2	Current-carrying parts and their connections 12
8.1.3	Clearances and creepage distances 12
8.1.4	Actuator 12
8.1.5	Indication of the contact position 12
8.1.6	Additional safety requirements for CPSs suitable for isolation 12
8.1.7	Terminals 13
8.1.8	Additional requirements for CPSs provided with a neutral pole 13
8.1.9	Provisions for protective earthing 13
8.1.10	Enclosures for CPSs 13
8.2	Performance requirements 13
8.2.1	Operating conditions 13
8.2.2	Temperature rise 17
8.2.3	Dielectric properties 19
8.2.4	Performance under no load, normal load and overload conditions 19
8.2.5	Ability to make, carry and break short-circuit currents 24
8.2.6	Switching overvoltages 25
8.3	Electromagnetic compatibility (EMC) 25
8.3.1	General 25
8.3.2	Immunity 25
8.3.3	Emission 26
9	Tests 26
9.1	Kind of tests 26
9.1.1	General 26
9.1.2	Type test 26
9.1.3	Routine tests 26
9.1.4	Sampling tests 27
9.1.5	Special tests 27

	<i>Page</i>
9.2 Compliance with constructional requirements	27
9.3 Compliance with performance requirements	27
9.3.1 Test sequences	27
9.3.2 General test conditions	27
9.3.3 Performance under no load, normal load and overload conditions	28
9.3.4 Performance under short-circuit conditions	31
9.3.5 EMC tests.....	33
9.4 Test sequences	42
9.4.1 Test Sequence I: Temperature-rise, operating limits, dielectric properties	44
9.4.2 Test Sequence II: Performance under normal load and overload conditions.....	46
9.4.3 Test Sequence III: Operational performance before and after operating sequences at I_{cr} and "r" current test.....	47
9.4.4 Test Sequence IV: Operational performance before and after operating sequences at I_{cs}	48
9.4.5 Test Sequence V: Additional breaking capacity.....	49
9.4.6 Test Sequence VI: Additional test sequence for four-pole CPSs	49
9.4.7 Test Sequence VII: Additional test sequence for CPSs intended for use in an individual enclosure.....	50
9.4.8 Test sequence VIII: EMC	50
9.5 Routine tests	50
9.5.1 General	50
9.5.2 Operation and operating limits	51
9.5.3 Dielectric tests.....	51
9.6 Sampling plans and test procedure.....	52
Annex A (normative) Special tests	57
Annex B (normative) Dielectric withstand verification	60
Annex C (normative) Marking and identification of CPS terminals	62
Annex D (informative) Items subject to agreement between manufacturer and user	66

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard**Low-voltage switchgear and controlgear****Part 6.2: Multiple function equipment—Control and protective switching devices (or equipment)(CPS)**

Any IEC table, figure or passage of text that is struck-through is not part of this Standard. Any Australian/New Zealand table, figure or passage of text that is added (and identified by shading) is part of this Standard.

1 Scope and object

This section of IEC 60947-6 applies to control and protective switching devices (or equipment) (CPS), the main contacts of which are intended to be connected to circuits of rated voltage not exceeding 1 000 V a.c. or 1 500 V d.c.

CPSs are intended to provide both protective and control functions for circuits and are operated otherwise than by hand. They may also fulfill additional functions, such as isolation.

The object of this section is to state:

- The characteristics of CPSs;
- The conditions with which CPSs shall comply with reference to their operation and behaviour, their dielectric properties, the degree of protection provided by their enclosure where applicable;
- The tests intended to verify that these conditions have been met, and the methods to be adopted for these tests;
- The information to be marked on or given with the CPSs.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this section of IEC 60947-6. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this section of IEC 60947-6 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

References to International Standards that are struck through in this Clause are replaced by references to equivalent Australian or Australian/New Zealand Standards that are listed immediately thereafter and identified by shading. Any Australian or Australian/New Zealand Standard that is identical to the International Standard it replaces is appropriately identified.

~~IEC 60034-1:1983, *Rotating electrical machines—Part 1: Rating and performance*~~