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Australian/New Zealand Standard™

Low-voltage switchgear and controlgear

**Part 6.1: Multiple function equipment—
Automatic transfer switching equipment**



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Australian/New Zealand Standard™

Low-voltage switchgear and controlgear

Part 6.1: Multiple function equipment— Automatic transfer switching equipment

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL-006, Industrial Switchgear and Controlgear to supersede AS 3947.6.1—1996.

The objective of this Standard is to provide characteristics of the equipment, conditions with which the equipment must comply, tests intended to confirm these conditions have been met and data to be marked on the equipment and provided by the manufacturer.

This Standard is Part 6.1 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 (this Standard)
AS/NZS 3947.6.2	Part 6.2: Multiple function equipment—Control and protective switching devices (or equipment) (CPS)
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 60947-6-1:1989 + Corrigendum: 1991 + A1:1994 + A2:1997, *Low-voltage switchgear and controlgear—Part 6-1: Multiple function equipment—Automatic transfer switching equipment*.

The provisions of AS/NZS 3947.1, General rules 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 3947.6.1—1996 by the addition of IEC Amendment 2:1997 which adds appropriate IEC Standards, electromagnetic compatibility requirements and modifications to utilization category and product information.

A vertical line in the margin shows where IEC 60947-6-1:1989 has been modified by amendments 1 and 2 and the Corrigendum.

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 term ‘informative’ has been used in this Standard to define the application of the annex to which it applies. An ‘informative’ annex is only for information and guidance.

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STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard**Low-voltage switchgear and controlgear****Part 6.1: Multiple function equipment—Automatic transfer switching equipment**

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 General

The provisions of the General Rules, IEC Publication 60947-1, are applicable to this standard, where specifically called for. General Rules clauses and sub-clauses thus applicable, as well as tables, figures and appendices are identified by references to Part 1, for example: 'Sub-clause 1.2.3, table 4 or Appendix A of Part 1'.

1.1 Scope

This standard applies to Automatic Transfer Switching Equipment (ATSE) to be used in emergency power systems with interruption of the supply to the load during transfer, the rated voltage of which does not exceed 1 000 V a.c. or 1 500 V d.c. It covers ATSE provided with or without an enclosure.

Devices necessary for the control (e.g. control switches, ...) and the protection (e.g. circuit-breakers, ...) of an ATSE shall comply with the requirements of the relevant IEC standards.

ATSE used only for emergency lighting may be subject to specific rules and/or legal requirements and are not, therefore, covered by this standard.

1.2 Object

The object of this standard is to state:

- 1) the characteristics of the equipment.
- 2) the conditions with which the equipment must comply with reference to:
 - a) operation for which the equipment is intended;
 - b) operation and behaviour in case of specified abnormal conditions, for example, short circuit;
 - c) dielectric properties.
- 3) The tests intended to confirm that these conditions have been met and the methods for performing these tests.
- 4) The data to be marked on the equipment and provided by the manufacturer.

1.3 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60947. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 60947 are encouraged to investigate the possibility of applying the most recent editions of the normative documents 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 60112:1979, Methods for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions~~

AS/NZS 4695.112, Fire hazard testing of electrotechnical products, Part 112: Method for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions (Identical to IEC 60112:1979)

~~IEC 60947-1:1996, Low-voltage switchgear and controlgear—Part 1: General rules~~

AS/NZS 3947.1, Low-voltage switchgear and controlgear, Part 1: General rules (Identical to IEC 60947-1:1996)

~~IEC 60947-2:1995, Low-voltage switchgear and controlgear—Part 2: Circuit-breakers~~

AS 3947.2, Low-voltage switchgear and controlgear, Part 2: Circuit-breakers (Identical to IEC 60947-2:1995)

~~IEC 60947-4-1:1990, Low-voltage switchgear and controlgear—Part 4: Contactors and motor-starters—Section 1: Electromechanical contactors and motor-starters~~

AS/NZS 3947.4.1, Low-voltage switchgear and controlgear, Part 4.1: Contactors and motor-starters—Electromechanical contactors and motor-starters

~~IEC 61000-4-1:1992, Electromagnetic compatibility (EMC)—Part 4: Testing and measurement techniques—Section 1: Overview of immunity tests—Basic EMC publication~~

AS/NZS 61000.4.1, Electromagnetic compatibility (EMC), Part 4.1: Testing and measurement techniques—Overview of immunity tests (Identical to IEC 61000-4-1:1992)

IEC 61000-4-2:1995, Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 2: Electrostatic discharge immunity test – Basic EMC publication

~~IEC 61000-4-3:1995, Electromagnetic compatibility (EMC)—Part 4: Testing and measurement techniques—Section 3: Radiated, radio-frequency, electromagnetic field immunity test~~

AS/NZS 61000.4.3, Electromagnetic compatibility (EMC), Part 4.3: Testing and measurement techniques—Radiated radio-frequency, electromagnetic field immunity test (Identical to IEC 61000-4-3:1995)

IEC 61000-4-4:1995, Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 4: Electrical fast transient/burst immunity test – Basic EMC publication

~~IEC 61000-4-5:1995, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 5: Surge immunity test*~~

AS/NZS 61000.4.5, *Electromagnetic compatibility (EMC), Part 4.5: Testing and measurement techniques—Surge immunity test* (Identical to IEC 61000-4-5:1995)

~~IEC 61000-4-6:1996, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 6: Immunity to conducted disturbances, induced by radio-frequency fields*~~

AS/NZS 61000.4.6, *Electromagnetic compatibility (EMC), Part 4.6: Testing and measurement techniques—Immunity to conducted disturbances, induced by radio-frequency fields* (Identical to IEC 61000-4-6:1996)

CISPR 11:1990, *Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment*

2 Definitions

For the purpose of this standard the relevant definitions given in Clause 2 of Part 1 and the following additional definitions shall apply:

2.1 Switching devices

2.1.1 Transfer switching device (transfer switch)

A device for transferring one or more load circuits from one supply to another.

2.1.2 Automatic transfer switching equipment (ATSE)

Self-acting equipment containing the transfer switching device(s) and other necessary devices for monitoring supply circuits and for transferring one or more load circuits from one supply to another.

2.2 Operation of ATSE

2.2.1 Operating sequence

The operating sequence of ATSE consists of an automatic transfer of a load from the normal supply to an alternative supply in the event of a monitored supply deviation and automatically returning the load to the normal supply when it is restored. The transfer may be with or without a predetermined time delay and may include an off position.

In the case of both the normal and the alternative supplies being present, the ATSE shall assume the normal supply position.

2.2.2 Monitored supply deviation

A variation in the power supply characteristics being monitored so that it signals the ATSE to operate when a deviation from the specified limits occurs, for example, abnormal changes in voltage or frequency of the supply.

2.2.2.1 Voltage supply deviation

The change or loss of voltage of the normal power supply.

2.2.2.2 Frequency supply deviation

The change in frequency from the normal operating frequency of the normal supply.

2.2.3 Operating times

2.2.3.1 Contact transfer time

The time measured from the parting of one set of main contacts from one power supply to the closing of a second set of main contacts on an alternative power supply.

2.2.3.2 Operating transfer time

The time measured from the instant of the monitored supply deviation to the closing of main contacts on an available alternative supply source, exclusive of any purposely introduced time delay.

2.2.3.3 Total operating time

The sum of operating transfer time and any purposely introduced time delay.

2.2.3.4 Return transfer time

The time from the instant when the normal supply is fully restored to the instant when the set of main contacts is closed on the normal supply, plus any purposely introduced time delay.

2.2.3.5 Off-time

The time measured during transfer from the instant of final arc extinction in all poles to the closing of main contacts on another supply, including any purposely introduced time delay.

2.3 Main contact positions

2.3.1 Normal position

The contact position of the equipment when there is no deviation of the normal supply.

2.3.2 Alternative position

The contact position of the equipment when the load circuit is switched on the alternative (emergency) supply in the event of a monitored supply deviation of the normal supply.

2.3.3 Off position

The contact position of the equipment when the load circuit is not switched on any supply.

NOTE – This position results from either automatic tripping caused by a fault in the load circuit or intentional interruption of the automatic transfer function.

3 Classification

Automatic transfer switching equipment is classified as Class PC or Class CB.

Class PC: ATSE that is capable of making and withstanding, but is not intended for breaking short-circuit currents.

Class CB: ATSE provided with overcurrent releases and the main contacts of which are capable of making and are intended for breaking short-circuit currents.

4 Characteristics

4.1 Summary of characteristics

Wherever practicable the characteristics of the ATSE shall be stated as follows:

- Type of equipment (Sub-clause 4.2).
- Rated and limiting values for the main circuit (Sub-clause 4.3).
- Utilization category (Sub-clause 4.4).
- Control circuits (Sub-clause 4.5).
- Auxiliary circuits (Sub-clause 4.6).
- Switching overvoltages (Sub-clause 4.9).

4.2 Type of equipment

The following shall be stated:

- class of equipment;
- number of poles;
- kind of current;
- operating sequence.

4.3 Rated and limiting values for the main circuit

Sub-clause 4.3 of Part 1 applies. However, minimum values for Sub-clauses 4.3.6.1, 4.3.6.3 and 4.3.6.4 are given in table 4.

4.3.1 Rated voltages

4.3.1.1 Rated operational voltage (U_e)

Sub-clause 4.3.1.1 of Part 1 applies.

4.3.1.2 Rated insulation voltage (U_i)

Sub-clause 4.3.1.2 of Part 1 applies.

4.3.1.3 Rated impulse withstand voltage (U_{imp})

Sub-clause 4.3.1.3 of Part 1 applies.

4.3.2 Rated operational current (I_e)

The rated operational current of ATSE is the rated uninterrupted current (I_U). See Sub-clause 4.3.2.4 of Part 1.

4.3.3 Rated frequency

Sub-clause 4.3.3 of Part 1 applies.

4.3.4 Uninterrupted duty

Sub-clause 4.3.4.2 of Part 1 applies.

4.3.5 Rated making and breaking capacities

The rated making and breaking capacities are the values of current, stated by the manufacturer, which the transfer equipment can satisfactorily make and break under specified conditions. Unless stated otherwise, they are given in terms of a steady state current value. During the making operation, the peak value of the current on contact closing may be higher than the peak value of the steady state current depending on the characteristics of the test circuit (load) and the instant of closing on the voltage wave.

The rated making and breaking capacities are stated with reference to the rated operational voltage, the rated operational current and the utilization category according to table 2.

For a.c., the rated making and breaking capacities are expressed by the r.m.s. value of the a.c. component of the current.

4.3.6 Short-circuit characteristics

4.3.6.1 Rated short-time withstand current (I_{cw})

The rated short-time withstand current is the value of short-time withstand current stated by the manufacturer which the equipment can carry under the test conditions specified in Sub-clause 8.3.4.3.

For a.c., the value of the current is the r.m.s. value of the a.c. component and the highest peak value in any one phase shall be not less than n times this r.m.s. value, the ratio n being given in table 16 of Part 1.

The minimum value of the short-time withstand current is given in column 2 of table 4.

NOTE – Additional lower values of short-time withstand current for longer durations may be stated by the manufacturer.

The minimum durations are:

- 3 half-cycles of the rated frequency or 0,025 s for d.c. for rated operational currents up to and including 400 A;
- 3 cycles of the rated frequency or 0,05 s for d.c. for rated operational currents higher than 400 A.

4.3.6.2 Rated short-circuit making capacity (I_{cm})

The rated short-circuit making capacity is the value of short-circuit making capacity assigned by the manufacturer for the rated operational voltage at rated frequency and at a specified power-factor (or time-constant). It is expressed as the maximum prospective peak current.

For class CB ATSE and for a.c., the rated short-circuit making capacity shall be not less than highest value of short-circuit breaking capacity, multiplied by the ratio n of table 16 of Part 1. The manufacturer may assign a higher value of short-circuit making capacity.

For d.c., the rated short-circuit making capacity shall be not less than its rated short-circuit breaking capacity, on the assumption that the steady-state short-circuit current is constant.

A rated short-circuit making capacity implies that the ATSE shall be able to make the current corresponding to that rated capacity at an applied voltage up to and including that corresponding to 105 % of the rated operational voltage.