

Australian Standard[®]

**A.C. MOTOR STARTERS
(UP TO AND INCLUDING 1000 V)**

**Part 3—AUTOTRANSFORMER
STARTERS**

The following scientific, industrial and governmental organizations were officially represented on the committee entrusted with the preparation of this standard:

Associated Chambers of Manufactures of Australia

Australian Electrical Manufacturers Association

Australian-British Trade Association

Department of Defence

Department of Industry and Commerce

Electricity Supply Association of Australia

Institution of Engineers, Australia

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PREFACE

This standard was prepared by a subcommittee of the Association's Committee on Industrial Switchgear and Controlgear. It forms one part of a four-part standard for a.c. motor starters being published to supersede AS C381—1967, Reduced Current Motor Starters, where a.c. starters up to 1000 V are concerned (for a.c. starters over 1000 V and d.c. starters, AS C381 is still applicable).

Part 1 of this standard applies to direct-on-line (full voltage) starters, Part 2 to star-delta starters, and Part 4 to rheostatic rotor starters.

It applies to autotransformer starters for industrial use, intended to start in the starting position, accelerate an induction motor to normal speed, provide means for the protection of the motor and its associated circuits against operating overloads, and cause the motor to stop intentionally, and of which the main contacts are intended to be connected to circuits of rated voltages not exceeding 1000 V a.c.

This standard is based on the International Electrotechnical Commission Publication 292-4, Low Voltage Motor Starters, Part 4—Reduced Voltage A.C. Starters—Two-step Autotransformer Starters, and acknowledgment is made to the assistance received therefrom. However, some of the requirements of that publication have been modified to take account of local conditions. Where this standard deviates technically from the IEC document, by way of additional or different requirements, this deviation is indicated by a rule in the margin against the clause, or part thereof, affected.

In the application of this standard reference may be necessary to the following Australian standards:

AS 1023	Thermal Protection of Electric Motors Part 1—Built-in Thermal Detectors and Associated Control Units
AS 1029	A.C. Contactors (up to and including 1000 V)
AS 1202	A.C. Motor Starters (up to and including 1000 V) Part 1—Direct-on-line (Full Voltage) Starters
AS 1431	Control Switching Devices Part 1—General Requirements Part 4—Contactor Relays*

* In course of preparation.

CONTENTS

	<i>Page</i>
SECTION 1. SCOPE, OBJECT AND APPLICATION	
1.1 Scope	5
1.2 Object	6
1.3 Application	6
SECTION 2. DEFINITIONS	
2.1 Application of Section	7
2.2 Autotransformer	7
2.3 Autotransformer Starter	7
2.4 Undercurrent Relay	7
2.5 Two-step Starters	7
2.6 Starting Time	7
2.7 Open Transition of an Autotransformer Starter	7
2.8 Closed Transition of an Autotransformer Starter	7
SECTION 3. CLASSIFICATION	
3.1 General	8
3.2 Classification of Starters According to the Method of Changing Starting Steps	8
3.3 Classification of Starters According to Method of Transition	8
3.4 Classification of Starters According to the Means of Cooling the Autotransformer	8
SECTION 4. CHARACTERISTICS OF AUTOTRANSFORMER STARTERS	
4.1 Summary of Characteristics	9
4.2 Types of Switching Devices	9
4.3 Types and Characteristics of Relays and Releases	9
4.4 Rated Values	9
4.5 Control Circuits and Air Supply Systems	13
4.6 Auxiliary Circuits	13
4.7 Coordination with Short-circuit Protective Devices	13
4.8 Types and Characteristics of Automatic Changeover Devices	13
4.9 Types and Characteristics of Autotransformers for Autotransformer Starters	13
SECTION 5. NAMEPLATE AND DIAGRAM	
5.1 General	14
SECTION 6. CONDITIONS FOR OPERATION IN SERVICE	
6.1 General	14
SECTION 7. CONDITIONS FOR CONSTRUCTION	
7.1 Mechanical Design	15
7.2 Enclosures	15
7.3 Temperature Rise	15
7.4 Dielectric Properties	15
7.5 Operating Conditions	16

SECTION 8. TESTS		<i>Page</i>
8.1	Testing	17
8.2	Verification of the Characteristics of Starters	17
8.3	Type Tests	17
8.4	Routine Tests	23
8.5	Special Tests	23
APPENDICES		
A	Information to be Supplied by the Purchaser	24
B	Clearance and Creepage Distances	24
C	Coordination with Short-circuit Protective Devices	24
D	Conventional Test Circuit for Verification of Making and Breaking Capacities and for Verification of Reversibility	24
E	Approximate Full-load Line Currents for 415 V Three-phase Induction Motors	24
F	Autotransformer Start—Typical Curves.	25
G	Typical Methods and Diagrams of Starting Alternating Current Induction Motors by Means of Autotransformers	26

STANDARDS ASSOCIATION OF AUSTRALIA

**Australian Standard Specification
for
A.C. MOTOR STARTERS
(up to and including 1000 V)**

PART 3—AUTOTRANSFORMER STARTERS

SECTION 1. SCOPE, OBJECT AND APPLICATION

1.1 SCOPE. This Part of the specification applies to two-step autotransformer starters for industrial use, intended to start in the starting position, accelerate an induction motor to normal speed, provide means for the protection of the motor and its associated circuits against operating overloads, and cause the motor to stop intentionally.

NOTE: Autotransformer starters with more than two steps are considered as special cases subject to agreement between purchaser and manufacturer.

The autotransformer starters dealt with in this Part are not intended for reversing motors rapidly and, therefore, utilization category AC-4 included in Part 1* does not appear. Moreover, they are not normally designed to interrupt short-circuit currents; therefore, suitable short-circuit protection should form part of the installation but not necessarily in the starter (see Appendix C of Part 1).

This Part applies only to starters, the main contacts of which are intended to be connected to circuits the rated voltage of which does not exceed 1000 V a.c.

The clauses of this Part relating to overload protection are not applicable to starters operating in conjunction with over-temperature devices built into the motors (see AS 1023, Part 1†).

NOTES:

1. In the starting position, the current in the line and the torque of the motor related to the motor starting with rated voltage are reduced approximately as the square of the ratio (starting voltage)/(rated voltage). Therefore, auto-transformer starters are used when the inrush current due to the starting is to be limited, or when the driven machine requires a limited torque for starting. Typical curves for starting current, of starting torque of the motor, and of torque of the driven machine are shown in Fig. F1).
2. In order to avoid too large a peak of current or torque when changing the connection from start to run, it is recommended that this changeover occur only when the motor has reached a speed higher than 80 percent of its rated speed (see Appendix F).

* AS 1202, Part 1, Direct-on-line (Full Voltage) Starters.

† AS 1023, Thermal Protection of Electric Motors, Part 1—Built-in Thermal Detectors and Associated Control Units.

1.2 OBJECT. The object of this Part of the specification is to state—

- (a) the characteristics of autotransformer starters;
- (b) the conditions with which starters must comply with reference to—
 - (i) their operation and behaviour;
 - (ii) their dielectric properties
 - (iii) the degree of protection provided by their enclosures;
- (c) the tests intended for confirming that these conditions have been met, and the methods to be adopted for these tests; and
- (d) the data to be marked on the apparatus.

1.3 APPLICATION. Autotransformer starters shall, in addition to complying with the requirements of this Part of the specification, comply with the requirements of Part 1 except where amended by this Part.

SECTION 2. DEFINITIONS*

2.1 APPLICATION OF SECTION. For the purpose of this Part of the specification, the following definitions and those given in Part 1 apply.

2.2 AUTOTRANSFORMER—a transformer in which at least two windings have a common part.

2.3 AUTOTRANSFORMER STARTER—a starter for an induction motor which uses for starting one or several reduced voltages derived from an autotransformer.

2.4 UNDERCURRENT RELAY—a measuring relay which operates when the current through it is reduced below the operating value.

2.5 TWO-STEP STARTERS—a starter in which there is only one intermediate accelerating position between the OFF and FULL ON positions.

2.6 STARTING TIME (t_s)—the length of time the autotransformer carries current.

2.7 OPEN TRANSITION OF AN AUTOTRANSFORMER STARTER—that circuit in which the current to the motor is interrupted when changing over from one step to another.

2.8 CLOSED TRANSITION OF AN AUTOTRANSFORMER STARTER—that circuit in which the current to the motor is not interrupted (even momentarily) when changing over from one step to another.

NOTE: The transition stage is not considered an additional step.

* For other definitions, reference should be made to the standards listed in the Preface and to AS 1852, International Electrotechnical Vocabulary.