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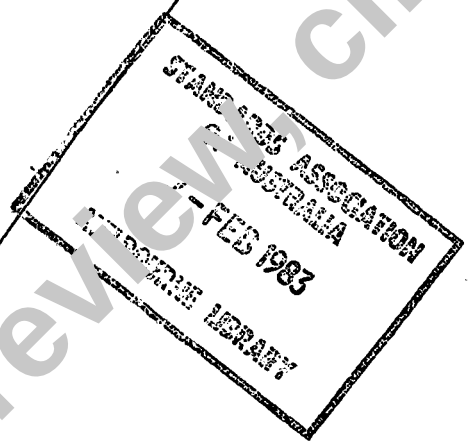
Australian Standard 1359, Part 33—1983

GENERAL REQUIREMENTS FOR ROTATING ELECTRICAL MACHINES

Part 33—METHODS FOR DETERMINING LOSSES AND EFFICIENCY



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PREFACE

This part of the standard was prepared by the Association's Committee on Rotating Electrical Machinery.

In the preparation of this part of the standard, reference was made to IEC 34-2, Rotating Electrical Machines—Part 2: Methods for Determining Losses and Efficiency of Rotating Electrical Machinery from Tests (Excluding Machines for Traction Vehicles), and IEC 34-2A, Measurement of Losses by the Calorimetric Method. Acknowledgement is made of the assistance received from those documents.

This part of the standard follows the IEC publications very closely although the material has been rearranged and edited for clarity.

In previously issued parts of this standard, each clause number was prefixed by the part number. In order to avoid lengthening the clause numbers herein, the part number prefix has not been used.

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STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard
for
GENERAL REQUIREMENTS FOR ROTATING ELECTRICAL MACHINES

PART 33—METHODS FOR DETERMINING LOSSES AND EFFICIENCY

SECTION 1. SCOPE AND GENERAL

1.1 SCOPE. This Part of the standard sets out methods of determining the losses and efficiency of d.c. machines and polyphase a.c. synchronous and induction machines. The principles may, however, be applied to other types of machines such as rotary convertors, a.c. commutator motors and single-phase induction motors for which other methods of determining losses are generally used.

1.2 OBJECT. This Part of the standard is intended to establish methods of determining efficiencies from tests, and also to specify methods of determining particular losses when these are required for other purposes.

1.3 REFERENCED DOCUMENTS. The following standards are referred to in this standard:

AS 1024	Direct Recording Electrical Measuring Instruments and Their Accessories
AS 1042	Direct-acting Indicating Electrical Measuring Instruments and Their Accessories
AS 1243	Voltage Transformers for Measurement and Protection
AS 1359	General Requirements for Rotating Electrical Machines Part 60—Tests 1359.69—Tolerances
AS 1384	Transducers for Electrical Measurements
AS 1675	Current Transformers for Measurement and Protection
AS 1852	International Electrotechnical Vocabulary 1852(411)—Rotating Machines
AS C320	Classification of Insulating Materials for Electrical Machinery and Apparatus on the Basis of Thermal Stability in Service
ISO 5167	Measurement of Fluid Flow by Means of Orifice Plates, Nozzles and Venturi Tubes Inserted in Circular Cross-section Conduits Running Full

1.4 CONDITIONS OF TEST.

1.4.1 Condition of Machine. Tests shall be conducted on a complete machine with all covers fitted in the manner required for normal service, with any devices for automatic voltage regulation not a composite part of the machine itself being made inoperative, unless otherwise agreed.

1.4.2 Instrumentation.

1.4.2.1 *Accuracy.* Measuring instruments and their accessories, such as measuring transformers, shunts and bridges used during the tests, unless otherwise specified, shall have the following accuracy:

(a) Instruments for measuring d.c. resistance..... Accuracy Class 0.5 or better.

(b) Other instruments ..... Accuracy Class 1.0 or better.

(See AS 1024, AS 1042, AS 1243, AS 1384 and AS 1675.)

1.4.2.2 *Readability.* Instruments shall be selected to give readings over the effective range such that a fraction of a division is a small percentage of the actual reading and can be easily estimated.

1.4.3 Measurement of Speed of Rotation. Speed of rotation may be measured by a stroboscopic method digital counter or tachometer. Where slip is measured, the synchronous speed shall be determined from the supply frequency during the test.

1.4.4 Groups of Machines. Where the overall efficiency or the absorbed power is measured for a group of machines comprising two electrical machines, or a machine and a transformer, or a generator and its driving machine, or a motor and its driven machine, there is no need to indicate the individual efficiencies. If, however, these are given separately, they should be regarded as approximate.

1.5 DEFINITIONS. For the purpose of this Part of the standard, the definitions given in AS 1852(411) and the following apply:

1.5.1 Efficiency—the ratio of output to output-plus-losses expressed as per unit (p.u.), i.e.—

$$\eta = \frac{\text{Output}}{\text{Output} + \text{Losses}}$$

1.5.2 Total loss—the difference between the input and the output.

1.5.3 Braking test—a test in which the mechanical power output of a machine acting as a motor is determined by the measurement of the shaft torque, by means of a brake or dynamometer, together with the rotational speed. Alternatively, a test performed on a machine acting as a generator, by means of a dynamometer to determine the mechanical power input.

1.5.4 Calibrated driving machine test—a test in which the mechanical input (or output) of an electrical machine is calculated from the electrical output (or