Australian Standard®

Rotating electrical machinery—General requirements

Part 102.2: Methods for determining losses and efficiency—Calorimetric method

This Australian Standard was prepared by Committee EL/9, Rotating Electrical Machinery. It was approved on behalf of the Council of Standards Australia on 10 March 1997 and published on 5 July 1997.

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Australian Chamber of Commerce and Industry

Australian Electrical and Electronic Manufacturers Association

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PREFACE

This Standard was prepared by the Standards Australia Committee EL/9, Rotating Electrical Machinery, to supersede in part, AS 1359.33—1983, *General requirements for rotating electrical machines*, Part 33: *Methods for determining losses and efficiency*.

This Standard is based on IEC 34-2A, *Rotating electrical machines*, Part 2: *Methods for determining losses and efficiency of rotating electrical machinery from tests (excluding machines for traction vehicles)*, First supplement: *Measurement of losses by the calorimetric method*.

This Standard is a Part of the AS 1359 series listed in AS 1359.0, Part titled: *Introduction and list of Parts*.

The objective of this Standard is to provide the rotating electrical machine industry with the calorimetric method of determining losses and efficiency mainly of large generators.

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1 SCOPE AND REFERENCED DOCUMENTS

1.1 Scope This Standard specifies methods for determining losses and efficiency that have been devised mainly for large generators, but the principles used can also be applied to other machines.

The calorimetric method can be used to determine the efficiency of electrical rotating machinery either—

(a) by the determination of the total losses on load; or

(b) by the determination of the segregated losses and hence the conventional total loss by summation of the segregated losses.

Depending upon the circumstances, calorimetric measurements may be made in two different ways as follows:

(i) Measurement of the quantity and rise in temperature of the cooling medium (direct method).

(ii) Calibration of the rise in temperature of the cooling medium.

The calorimetric measurements should be performed for each cooling circuit, either primary or secondary, separately.

The symbols used are shown in Table 1.

1.2 Referenced documents The following Standards are referred to in this Standard:

AS
2360 Measurement of fluid flow in closed conduits
2360.1 Pressure differential methods (published in Sections)

2 GENERAL CONSIDERATIONS FOR CALORIMETRIC TESTING

2.1 Stable conditions Provided that the operating conditions and inlet temperature of the cooling medium are sufficiently stable, thermal equilibrium can be considered to have been achieved when measurements of rise in temperature and the volume rate of flow of the cooling medium indicate that the losses are constant to within ±0.01 p.u. over a period of 2 h, or when the temperature rise of the cooling medium does not vary by more than ±0.01 p.u. in 1 h, the volume rate of flow being constant.

If the inlet temperature of the cooling medium or the temperature of the windings varies by more than ±0.3°C/h, it may be very difficult to achieve thermal equilibrium. In such cases, a lower value should be aimed at. For the calorimetric measurement of air, this condition may be regarded as a criterion of thermal stability. However, for the determination of total losses or when close tolerances on measurement are not required, a variation of ±0.5°C/h is permissible.

If the inlet temperature of the cooling medium does not satisfy the conditions specified above, it may be necessary to postpone the tests until more suitable conditions prevail.