Australian Standard®

Rotating electrical machines — General requirements

Part 41 — General characteristics

This Australian standard was prepared by Committee EL/9, Rotating Electrical Machinery. It was approved on behalf of the Council of the Standards Association of Australia on 4 November 1985 and published on 6 January 1986.

PREFACE

This edition of this standard was prepared by the Association's Committee on Rotating Electrical Machinery. It supersedes AS 1359, General Requirements for Rotating Electrical Machines, Part 41—1974, General Characteristics, and incorporates the following material from IEC 34, Rotating Electrical Machines:

(a) IEC 34-12, Part 12—Starting Performance of Single-speed Three-phase Cage-induction Motors for Voltages Up to and Including 660 V (see Clause 41.3 herein).

(b) IEC 34-1, Part 1—Rating and Performance:

  (i) Clauses 18, 19, 20, 21, and 25.

  (ii) Proposed amendment to Clause 18.3 (based on document 2(Secretariat)657, December 1984)

In this edition, three-phase cage-induction motors are designated in accordance with their starting performance, namely: Designs N, NY, H, HY (as in IEC 34-12), and, for reduced locked-rotor currents, Designs NR, NS, HR, HS (not included in IEC 34-12). Previously specified Designs A, B, C, ... H, based on British practice, have been discontinued.

The main title of this standard has been rearranged slightly; this change is being progressively introduced to all standards in the AS 1359 series.

Review of Australian Standards. *To keep abreast of progress in industry, Australian Standards are subject to periodic review and are kept up to date by the issue of amendments or new editions as necessary. It is important therefore that Standards users ensure that they are in possession of the latest edition, and any amendments thereto.*

Full details of all Australian Standards and related publications will be found in the Standards Australia Catalogue of Publications; this information is supplemented each month by the magazine 'The Australian Standard', which subscribing members receive, and which gives details of new publications, new editions and amendments, and of withdrawn Standards.

Suggestions for improvements to Australian Standards, addressed to the head office of Standards Australia, are welcomed. Notification of any inaccuracy or ambiguity found in an Australian Standard should be made without delay in order that the matter may be investigated and appropriate action taken.

First published 1974
Reprinted 1978
Second edition 1986

This Standard was issued in draft form for comment as DR 83224.

ISBN 0 7262 3997 6

CONTENTS

Page

SPECIFICATION

41.1 Scope 4
41.2 Referenced Documents 4
41.3 Starting Performance of Single-speed Three-phase Cage-induction Motors of Rated Voltage up to 660 V 4
41.4 Momentary Overload 5
41.5 Pull-up Torque of Multispeed Three-phase Cage-induction Motors . . 6
41.6 Overspeed 6
41.7 Commutation 6

APPENDIX 41A. MEASUREMENT OF LOCKED-ROTOR APPARENT POWER AND LOCKED-ROTOR TORQUE OF CAGE-INDUCTION MOTORS . . 10

ANNEX. LIST OF REFERENCED DOCUMENTS 10

© Copyright – STANDARDS AUSTRALIA

Users of Standards are reminded that copyright subsists in all Standards Australia publications and software. Except where the Copyright Act allows and except where provided for below no publications or software produced by Standards Australia may be reproduced, stored in a retrieval system in any form or transmitted by any means without prior permission in writing from Standards Australia. Permission may be conditional on an appropriate royalty payment. Requests for permission and information on commercial software royalties should be directed to the head office of Standards Australia.

Standards Australia will permit up to 10 percent of the technical content pages of a Standard to be copied for use exclusively in-house by purchasers of the Standard without payment of a royalty or advice to Standards Australia.

Standards Australia will also permit the inclusion of its copyright material in computer software programs for no royalty payment provided such programs are used exclusively in-house by the creators of the programs.

Care should be taken to ensure that material used is from the current edition of the Standard and that it is updated whenever the Standard is amended or revised. The number and date of the Standard should therefore be clearly identified.

The use of material in print form or in computer software programs to be used commercially, with or without payment, or in commercial contracts is subject to the payment of a royalty. This policy may be varied by Standards Australia at any time.

STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard
for
ROTATING ELECTRICAL MACHINES—GENERAL REQUIREMENTS

PART 41—GENERAL CHARACTERISTICS

41.1 SCOPE. This standard specifies general characteristics of rotating electrical machines.

NOTE: Characteristics specific to synchronous generators are given in AS 1359.40.

41.2 REFERENCED DOCUMENTS. A list with titles of the standards referred to in this standard is given in the Annex.

41.3 STARTING PERFORMANCE OF SINGLE-SPEED THREE-PHASE CAGE-INDUCTION MOTORS OF RATED VOLTAGE UP TO 660 V.

NOTES:

1. Such motors are intended for direct-on-line (DOL) or star-delta (SD) starting, of duty rating S1 (maximum continuous rating (MCR), see AS 1359.30), and may be of any enclosure protection (IP) classification (see AS 1359.20).
2. The requirements may be applied to dual-voltage motors where the flux saturation level is the same for both voltages.
3. For measurement of locked-rotor apparent power and locked-rotor torque, see Appendix 41A.

41.3.1 Designations. Motors shall be designated as follows:

Design	*Designation indicates*
Design N	Normal torque
Design NR	Normal torque, reduced locked-rotor current
Design NS	Normal torque, specially reduced locked-rotor current
Design NY	Normal torque, arranged for star-delta connection
Design H	High torque
Design HR	High torque, reduced locked-rotor current
Design HS	High torque, specially reduced locked-rotor current
Design HY	High torque, arranged for star-delta connection

NOTES:

1. Other designs may be necessary for particular applications.
2. Manufacturers may quote tolerance zones provided the limiting values are not contravened.
3. The purchaser should indicate with enquiry and order any special requirements, e.g.:
   (a) Higher values of starting torque (T_l T_u, and T_b) than specified herein.
   (b) Maximum values of starting torque.

41.3.2 Design N, NR, NS motors.

41.3.2.1 *Description.* Design N, NR, and NS motors are normal torque motors intended for direct-on-line starting, having 2, 4, 6 or 8 poles and rated from 0.4 kW to 630 kW at frequencies of 50 Hz or 60 Hz.

NOTE: These motors are intended for driving loads having a square-law curve and might not be suitable for higher torque applications.

41.3.2.2 *Starting torque.* When measured at rated voltage, the starting torque, represented by the locked-rotor torque T_l, pull-up torque T_u, and breakdown torque T_b, each expressed as a per unit (p.u.) value of the rated torque T_N, shall be not less than the appropriate values given in Table 41.1.

At any speed between zero and that corresponding to 1.3 p.u. rated torque at near rated speed, the starting torque shall be not less than 1.3 times the torque obtained from a curve varying as the square of the speed and being equal to rated torque at rated speed (see Fig. 41.1).

NOTE: The factor 1.3 has been chosen with regard to an undervoltage of 10 percent in relation to the rated voltage at the motor terminals during the acceleration period.

41.3.2.3 *Locked-rotor apparent power (Designs N, NR, and NS).* When measured at rated voltage, the locked-rotor apparent power S_l in kilovolt amperes, expressed as a per unit value of the rated output P_N in kilowatts, shall be not greater than the appropriate value given in Table 41.2.

41.3.2.4 *Starting requirements.* A Design N, NR, or NS motor shall be capable of performing both the following starting sequences without experiencing undue difficulty or excessive temperature rise:

(a) From cold conditions, start once, switch off and allow to coast to rest, start again.

(b) From steady-state rated-load temperature (hot) conditions, start once.

In both sequences, the retarding torque due to the driven load shall be proportional to the square of the speed and equal to the rated torque at rated speed (see Fig. 41.1), and the external inertia shall be as given in Table 41.3.

NOTE: A Design N, NR, or NS motor, having been subjected to either of the above starting sequences, should not be subjected to a further start unless the motor temperature before starting does not exceed the steady-state temperature at rated load. It should be recognized that the number of starts should be minimized since these affect the life of the motor.

41.3.3 Design NY motors.

41.3.3.1 *Description.* Design NY motors are similar to Design N, but intended for star-delta starting. For these motors in star-connection, values for T_l and T_u of 0.25 p.u. of the values of Design N (see Table 41.1) may be expected.

41.3.3.2 *Starting requirements.* The starting requirements are as for Design N (see Clause 41.3.2.4). In addition, however, a reduced retarding torque is necessary as the starting torque in 'star' may be insufficient to accelerate some loads to an acceptable speed.

NOTE: It should be recognized that the number of starts should be minimized since these affect the life of the motor.

COPYRIGHT