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Part 2: Electronic converter-fed alternating current motors

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



9/3123/CD

COMMITTEE DRAFT (CD)

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IEC TC 9 : ELECTRICAL EQUIPMENT AND SYSTEMS FOR RAILWAYS

SECRETARIAT:

France

SECRETARY:

Mr Denis MIGLIANICO

OF INTEREST TO THE FOLLOWING COMMITTEES:

HORIZONTAL FUNCTION(S):

ASPECTS CONCERNED:

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Recipients of this document are invited to submit, with their comments, notification of any local regulations or technical reasons that may exist and should be considered should this proposal proceed, recognizing that failure to address such requirements could result in the need for new or existing "In Some Countries" clauses. (SEE [AC/22/2007](#) OR [NEW GUIDANCE DOC](#)).

TITLE:

Electric traction - Rotating electrical machines for rail and road vehicles - Part 2: Electronic converter-fed alternating current motors

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRIC TRACTION –
ROTATING ELECTRICAL MACHINES
FOR RAIL AND ROAD VEHICLES –****Part 2: Electronic converter-fed alternating current motors**

FOREWORD

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International Standard IEC 60349-2 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

This third edition cancels and replaces the second edition published in 2002. It constitutes a technical revision.

The main technical changes with regard to the previous edition are as follows:

- As the limits of vibration velocities have been changed in IEC 60034-14, the limits valid for traction motors are now directly stated in this standard.
- In addition to the existing method for measuring and calculating the sound power level, the methods described in ISO 3741, ISO 3743, ISO 3744, ISO 3745, ISO 9614 are also allowed. However, the maximum sound power levels and the correction for pure tones remain unchanged in Clauses C.7 and C.8.

The text of this standard is based on the following documents:

FDIS	Report on voting
9/1416/FDIS	9/1466/RVD

56
57 Full information on the voting for the approval of this standard can be found in the report on
58 voting indicated in the above table.

59 This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

60 The list of all parts of IEC 60349 series, published under the general title, *Electric traction –*
61 *Rotating electrical machines for rail and road vehicles*, can be found on the IEC website.

62 The committee has decided that the contents of this publication will remain unchanged until the
63 stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to
64 the specific publication. At this date, the publication will be

- 65 • reconfirmed,
66 • withdrawn,
67 • replaced by a revised edition, or
68 • amended.

69

70

**ELECTRIC TRACTION –
ROTATING ELECTRICAL MACHINES FOR RAIL
AND ROAD VEHICLES –**

Part 2: Electronic converter-fed alternating current motors

1 Scope and object

This part of IEC 60349 applies to converter-fed alternating current motors forming part of the equipment of electrically propelled rail and road vehicles, with exception of those synchronous electrical machines that are in the scope of Part 4.

The object of this part is to enable the performance of a motor to be confirmed by tests and to provide a basis for assessment of its suitability for a specified duty and for comparison with other motors.

This part also applies to motors installed on trailers hauled by powered vehicles.

The basic requirements of this part may be applied to motors for special purpose vehicles such as mine locomotives but this part does not cover flameproof or other special features that may be required.

It is not intended that this part apply to motors on small road vehicles, such as battery-fed delivery vehicles, factory trucks, etc. This part also does not apply to minor machines such as windscreen wiper motors, etc. that may be used on all types of vehicles.

The electrical input to motors covered by this part comes from an electronic converter.

At the time of drafting, only the following combinations of motors and converters had been used for traction applications, but it may also apply to other combinations which may be used in the future:

- asynchronous motors fed by electronic converters;
- synchronous motors with wound rotor fed by electronic converters.

The motors covered by this part are classified as follows Traction motors (Motors for propelling rail or road vehicles).

The machines covered by this part are classified as follows:

a) Traction motors

Motors for propelling rail or road vehicles, to which this International Standard applies from clause 2 to Annex E.

b) Auxiliary motors

Motors for driving compressors, fans, pumps, auxiliary generators or other auxiliary machines, to which this International Standard and other IEC publications apply according to Annex F (normative).

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60034-1, *Rotating electrical machines – Part 1: Rating and performance*

IEC 60034-8, *Rotating electrical machines – Part 8: Terminal markings and direction of rotation*

IEC 60034-9, *Rotating electrical machines – Part 9 – Noise limits*

IEC 60034-17, *Rotating electrical machines – Part 17: Cage induction motors when fed from convertors – Application guide*

IEC 60050-131, *International Electrotechnical Vocabulary – Part 131: Circuit theory*

IEC 60050-151, *International Electrotechnical Vocabulary – Part 151: Electrical and magnetic devices*

IEC 60050-411, *International Electrotechnical Vocabulary – Part 411: Rotating machinery*

IEC 60050-811, *International Electrotechnical Vocabulary – Part 811: Electric traction*

IEC 60085, *Thermal evaluation and designation*

IEC 60850, *Railway applications – Supply voltages of traction systems*

IEC 61672, *Electroacoustics – Sound level meters*

IEC 62498-1, *Railway applications – Environmental conditions for equipment – Part 1: Equipment on board rolling stock*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-131, IEC 60050-151, IEC 60050-411 and IEC 60050-811 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>

- IEC Electropedia: available at <http://www.electropedia.org/>

3.1 rated value

quantity value assigned, generally by a manufacturer, for a specified operating condition of a machine

140 Note 1 to entry: The rated voltage or voltage range is the rated voltage or voltage range between lines at the
141 terminals.

142 [SOURCE: IEC 60050-411:1996, 411-51-23]

143 **3.2** 144 **rating**

145 set of rated values and operating conditions

146 [SOURCE: IEC 60050-411:1996, 411-51-24]

147 **3.3** 148 **Continuous rating**

149 Mechanical output that the motor can deliver on the test bed for an unlimited time under the
150 conditions specified in 8.1 without exceeding the limits of temperature rise given in Table 2, all
151 other appropriate requirements in this part also being satisfied.

152 NOTE Several continuous ratings may be specified.

153 **3.4** 154 **Short-time rating (for example, one hour)**

155 Mechanical output that the motor can deliver on the test bed for the stated time without
156 exceeding the limits of temperature rise given in Table 2, the test being carried out as specified
157 in 8.1 starting with the motor cold, all other appropriate requirements in this part being also
158 satisfied.

159 **3.5** 160 **Short-time overload rating**

161 Mechanical output that the motor can deliver on the test bed for the stated time without
162 exceeding the limits of temperature rise given in Table 3, the test being started and carried out
163 as specified in 8.1.6.

164 NOTE Short-time overload ratings are of value in determining the suitability of motors for duties which involve
165 relatively long periods of operation below the continuous rating followed by a period above it. These are most likely
166 to occur in locomotive applications. They are not relevant to the repeated short load cycles of rapid transit and similar
167 duties, and should not be specified for such applications.

168 **3.6** 169 **Intermittent duty rating**

170 Duty cycle in which the motor may be operated without the temperature rises exceeding the
171 limits given in Table 2 at any point.

172 **3.7** 173 **Equivalent rating**

174 Continuous rating with constant values of voltage, current and speed that, as far as temperature
175 rise is concerned, is equivalent to the intermittent duty cycle which the motor has to withstand
176 in service.

177 NOTE This rating should be agreed between user and manufacturer.

3.8**Guaranteed rating**

Rating assigned by the manufacturer for test purposes.

Normally the continuous rating but in special cases the user and manufacturer may agree that it be a short-time or intermittent rating.

3.9**Rated voltage**

Root-mean-square value of the fundamental component of the line-to-line voltage applied to a motor when it is operating at a guaranteed rating.

NOTE For motors fed directly or indirectly from a contact system, it is normally the highest voltage (excluding transients) which can be applied to the motor when it is drawing the rated current, with the contact system at its nominal voltage as defined in Annex D.

3.10**Rated speed**

Speed at a guaranteed rating.

3.11**Maximum voltage**

Highest root-mean-square value of the fundamental component of the line-to-line supply voltage which can be applied to the motor in service.

3.12**Repetitive peak voltage**

Peak value of the waveform of the converter output voltage, any random transient peaks arising from line voltage transients or other causes being disregarded.

3.13**Maximum current**

Maximum current shown on the specified characteristic as defined in 5.3.

3.14**Maximum working speed**

Highest rotational speed assigned to the motor by the manufacturer

NOTE When the characteristics of the vehicle for which a traction motor is intended are specified, this speed is not less than that corresponding to the maximum service speed of the vehicle assuming fully worn metallic wheels or the minimum rolling diameter of rubber tyres.

3.15**THD:**

THD (symb.) ratio of the r.m.s. value of the sum of all the harmonic components (G_n) up to a specified order (H) to the r.m.s. value of the fundamental component (G_1):

$$THD = \sqrt{\sum_{n=2}^H \left(\frac{G_n}{G_1} \right)^2}$$

NOTE 1 The symbol G represents the r.m.s. value of the harmonic component (see IEC 61000-4-7:2002, chapter 3.2.3). It is replaced, as required, by the symbol I for currents or by the symbol U for voltages.

NOTE 2 The value of H is 50

221 **3.16**
222 **user**
223 normally the end customer, but can be delegated to an other organization

224 **3.17**
225 **manufacturer**
226 producer of machines

227 **3.18**
228 **system manufacturer**
229 organization which has the technical responsibility for the supply of the combined system

230 Note 1 to entry: The system manufacturer as defined above may also be the manufacturer of the motor, of the
231 inverter, of the control, or of all of them, or of none of them.

232
233
234

235 **4 Environmental conditions**

236 Unless otherwise specified by the user, the following environmental conditions are assumed:

237 a) Altitude

238 Height above sea level not exceeding Class A3 according IEC 62498-1.

239 b) Temperature

240 Air temperature in the shade Class T1 according IEC 62498-1.

241 Whenever motors are intended to operate where one or both of these limits will be exceeded,
242 special requirements may be agreed between user and manufacturer. For more information
243 refer to IEC 60034-1.

244 Furthermore, the user shall inform the manufacturer of any particularly severe environmental
245 condition such as dust, humidity, temperature, snow, dynamic effects, etc., to which the motors
246 will be subjected.

247 **5 Characteristics**

248 **5.1 Exchange of information**

249 The rating of traction motors fed in parallel by a common converter has to take into account the
250 effect on load-sharing of differences of wheel diameter and of motor characteristics as well as
251 weight transfer when operating at high coefficients of adhesion. The user is to be informed of
252 the maximum permissible difference in wheel diameter for the particular application.

253 The motor and converter designers shall collaborate to produce all the technical information
254 necessary to ensure that the combined unit will meet the requirements of this part of IEC 60349.

255 To fulfil this requirement, the motor designer shall provide the converter designer with all the
256 information necessary to fully evaluate the interaction between the motor and the converter.

257 The converter designer shall also provide the motor designer with the characteristics showing,
258 for example, the converter line-to-line output voltage (including the repetitive voltage peaks),
259 current, fundamental frequency, harmonics and power over the whole range of the application,
260 including operation at the maximum and minimum values of the contact-system voltage.

261 The documents recording this exchange of information shall form an integral part of the
262 specification of the motor and of the converter.

263 NOTE 1 For more information refer to IEC 61287-1, 5.3.1.1.

264 NOTE 2 The length of cable run between motor and converter and the effect on peak voltages seen at the motor
265 terminals should be considered.

266 NOTE 3 For information about wave fronts and the impact to the motor see IEC 60034-17.

267 **5.2 Reference temperature**

268 All characteristics, irrespective of the thermal class of the insulation system used on the motor
269 to which they apply, shall be drawn for a winding reference temperature of 150 °C which shall
270 be stated in the characteristics.

271 **5.3 Specified characteristics**

272 Motor specifications shall, as a general rule, include characteristic curves in accordance with
273 the relevant clauses of this part. These curves, defined as the "specified characteristics", shall
274 be plotted to the designed operating limits of each variable. Unless otherwise agreed between
275 user and manufacturer, the characteristics shall show the machine performance at the nominal
276 voltage of the supply system as defined in Annex D, and shall be submitted to the user before
277 the order for the motors is placed.

278 **5.4 Declared characteristics**

279 Declared characteristics are derived from the results of type tests carried out in accordance
280 with 8.2.1 and shall meet the requirements of 8.2.2.

281 Unless previously agreed, the declared characteristics of motors electromagnetically identical
282 with any previously manufactured for the same user or application shall be those of the existing
283 motors. In such a case, compliance with the characteristics shall be demonstrated by routine
284 tests only.

285 **5.5 Efficiency characteristics**

286 Efficiency characteristics shall take into account losses arising from the harmonics in the supply
287 from the converter. Power used for excitation of synchronous motors shall also be included in
288 the losses unless otherwise accounted for, (e.g. as an auxiliary load), in which case the
289 omission shall be stated in the characteristics.

290 **5.6 Traction motor characteristics**

291 The specified and declared characteristics of a traction motor shall be the converter-fed variable
292 frequency characteristics, which shall show motor line-to-line voltage, current, frequency, mean
293 torque and efficiency as a function of speed over the whole range of application of the motor.
294 Characteristics of asynchronous motors shall show slip and those of synchronous motors shall
295 show the excitation current. Voltage curves shall show the root-mean-square value of the
296 fundamental component. Current curves shall show the root-mean-square value of the
297 fundamental component and the total root-mean-square value. For motors used in the braking
298 mode, similar characteristics shall be produced showing the torque input and the electrical
299 output as a function of motor speed.

300 As an alternative to motor torque and speed, the characteristics may show tractive effort at the
301 rail and vehicle speed, in which case the gear ratio, wheel diameter and transmission losses
302 shall be stated. If conventional values are used for the latter, they shall be in accordance with
303 Figure B.1.

304 NOTE 1 Subclause 5.1 refers to the need for the exchange of information between the designers of the motor and
305 of the converter.

306 NOTE 2 Clause 1 refers to the need to consider the effect on parallel-fed motors of differing wheel diameters and of
307 weight transfer between axles.

308 **6 Marking**

309 **6.1 Nameplate**

310 All motors covered by this part of IEC 60349 shall carry a nameplate including at least the
311 following information:

- 312 a) Manufacturer's name.
- 313 b) Motor type designation.
- 314 c) Motor serial number.
- 315 d) Year of manufacture.

316 Furthermore, a serial number shall be punched on both the stator and rotor of every motor, and
317 motors designed for unidirectional rotation shall carry an arrow indicating the direction of
318 rotation.

319 NOTE The motor serial number and rotation arrow should be easily readable when the motor is installed
320 in the vehicle.

321 **6.2 Terminal and lead marking**

322 Terminal and lead markings shall be in accordance with IEC 60034-8 unless otherwise agreed.

323 **7 Test categories**

324 **7.1 General**

325 There are four categories of tests:

- 326 – type tests;
- 327 – reduced type test;
- 328 – routine tests;
- 329 – investigation tests.

330 Where further testing is to be undertaken in accordance with IEC 61377, it may be preferable,
331 to avoid duplication, that some type and investigation tests be carried out on the combined test
332 bed.

333 **7.2 Type tests**

334 **7.2.1 General**

335 Type tests are intended to prove the ratings, characteristics and performance of new types of
336 motor. They shall be carried out on one motor of every new design. Unless otherwise agreed,
337 the motor shall be one of the first ten manufactured. Where there is a change in place and/or
338 method of manufacture, refer to 7.3.

339 Before testing commences, the manufacturer shall provide the user with a test specification
340 outlining the tests to be undertaken to demonstrate compliance with this standard. Following
341 completion of the type tests, the manufacturer shall supply the user with a full test report.

342 **7.2.2 Type tests on converter supply**

343 If each motor is fed by its own converter, the type test shall preferably be carried out using the
344 converter to be employed in service, but, as an alternative, a supply which closely resembles
345 the supply from the vehicle converter in waveform and harmonics may be employed.

346 If several motors are fed in parallel from a single converter, the type test shall be carried out
347 on a single motor using a supply closely resembling the supply from the vehicle converter in
348 waveform and harmonics.

349 If agreed, the manufacturer shall demonstrate the similarity of the test and service supplies,
350 and shall state the likely effect on the performance of the motor of any difference between them.

351 Unless otherwise agreed, the type test shall be repeated if the electrical output characteristics
352 of the converter are changed.

353 **7.3 Reduced type test**

354 **7.3.1 General**

355 The reduced type test consists of the routine test and one temperature rise test out of 7.3.2 to
356 7.3.4. This reduced type test is applicable to demonstrate the similarity in repeat orders or
357 change of place and/or method of manufacture or for motors of the same electromagnetic and
358 cooling design at the same or higher rating.

359 If a reduced type test is planned and a repeat temperature rise test according to 7.3.2 is not
360 chosen, this additional temperature rise test out of 7.3.3. and 7.3.4 shall be performed as part
361 of the full type test to obtain the reference for the planned reduced type test.

362 The test parameters shall be maintained for any subsequent test on that design of motor.

363 The temperature rise measurements shall be carried out as detailed in 8.1.

364 If all of the following conditions are fulfilled, the full type test can be replaced by this reduced
365 type test.

366 a) The agreement between the user and the manufacturer is made.

367 a) The results of the reduced type test are within the tolerances established on the previous
368 motors.

369 b) The manufacturer provides a full type test report for a previous motor of the same
370 electromagnetic and cooling design at the same or higher rating.

371 **7.3.2 Repeat the type test temperature rise test with converter**

372 Use the same setup, voltage, frequency, torque, cooling and test duration of the type test again
373 (refer to 7.2.2).

374 **7.3.3 Repeat a temperature rise test with converter with different load**

375 The motor is fed by a converter. Voltage, frequency, torque, cooling and test duration can be
376 at the manufacturer's discretion, but the duration of the test shall be at least 1 h and at values
377 that do not over-stress the motor.

378 **7.3.4 Repeat a temperature rise test with sinusoidal supply**

379 The motor is connected to a sinusoidal supply. Voltage, frequency, torque, cooling and test
380 duration can be at the manufacturer's discretion, but the duration of the test shall be at least
381 1 h and at values that do not over-stress the motor.

382 **7.4 Routine tests**

383 Routine tests are intended to demonstrate that a motor has been assembled correctly, is able
384 to withstand the appropriate dielectric tests, and is in sound working order both mechanically
385 and electrically.

The routine tests specified in Clause 9 shall normally be carried out on all motors but, before placing an order, the user and manufacturer may agree to adopt an alternative test procedure (e.g. in the case of motors produced in large quantities under a strict quality assurance procedure). This may permit reduced routine testing of all motors or may require the full tests on a proportion of motors chosen at random from those produced on the order. Any such agreement shall require the dielectric tests specified in 9.5 to be carried out on all motors.

7.5 Investigation tests

Investigation tests are optional special tests performed to obtain additional information. They shall be carried out only if agreement between user and manufacturer has been reached before placing the order for manufacture of the motors. The results of these tests shall not influence acceptance of a motor unless similarly agreed.

7.6 Summary of tests

Table 1 lists the tests required for compliance with this part of IEC 60349.

Table 1 – Summary of tests

Type of motor	Test category	Subclause							
		Temperature rise	Short-time thermal test/heat run	Temperature rise test for reduced type test Converter or sinusoidal	Characteristics	Over-speed	Dielectric	Vibration	Noise
Asynchronous	Type	8.1	–	7.3.1 to 7.3.4 ^a	8.2	8.3	–	8.4	Annex C ^a
	Reduced type test ^a	–	–	7.3.1 to 7.3.4	9.3.1	9.4 ^a	9.5	9.6 ^a	–
	Routine	–	9.1 ^a	–	9.3.1	9.4 ^a	9.5	9.6 ^a	–
Synchronous	Type	8.1	–	7.3.1 to 7.3.4 ^a	8.2	8.3	–	8.4	Annex C ^a
	Reduced type test ^a	–	–	7.3.1 to 7.3.4	9.3.2	9.4 ^a	9.5	9.6 ^a	–
	Routine	–	9.2/9.1 ^a	–	9.3.2	9.4	9.5	9.6 ^a	–
All motors, including those type tested, shall be routine tested.									
^a Optional tests, subject to agreement between user and manufacturer.									

8 Type tests

8.1 Temperature-rise tests

8.1.1 General

The tests shall be carried out at the guaranteed ratings of the motor.

The rated mechanical output may be measured directly or indirectly at the motor shaft, or be obtained without measurement by supplying the motor at the voltage, current and frequency shown on the declared characteristics as producing the rated mechanical output.

In the case of continuous rating tests, the time to reach a steady temperature may be shortened by commencing the test at an increased load or reduced cooling provided that the rated conditions are subsequently maintained for at least 2 h or until it is demonstrated by appropriate means that steady temperatures have been reached.

412 Steady temperature is defined as a change in temperature of less than 2 K during the final hour
413 of the test

414 8.1.2 Cooling during rating tests

415 Motors shall be tested with the cooling arranged as in service with all those parts which would
416 affect the temperature rise, including any ducting and filters regarded as part of the vehicle in
417 place, or with an arrangement giving equivalent conditions. Cooling corresponding to that
418 produced by air movement on the vehicle shall be subject to agreement between user and
419 manufacturer.

420 If cooling is by forced ventilation, the static pressure and the airflow should be measured at the
421 inlet to the motor so that a table giving the relationship between these two quantities may be
422 drawn up..

423 If cooling is by self-ventilation with ducts, the air quantity has to be measured in function of the
424 motor speed.

425 In case of liquid cooling, the static pressure and the liquid flow shall be measured at the inlet
426 to the machine so that a table giving the relationship between these two quantities may be
427 drawn up.

428 8.1.3 Measurement of temperature

429 The temperature shall be measured in accordance with Annex A.

430 8.1.4 Judgement of results

431 The temperature rises of the windings and slip rings at the “commencement of cooling” as
432 defined in A.4 shall not exceed the values given in Table 2.

433 8.1.5 Limits of temperature rise

434 The different thermal classes of insulation systems are defined in IEC 60085.

435 Table 2 gives the permissible limits of temperature rise above the temperature of the coolant,
436 measured on the test bed, for windings and other parts insulated with materials of the thermal
437 classes presently used in the construction of motors to which this part applies.

438 If the maximum specified inlet cooling medium temperature is higher than 40°C, the permissible
439 temperature rise according to table 2 shall be reduced by the difference between the maximum
440 specified inlet cooling medium temperature and 40°C.

441 If different parts of the same machine have different thermal classes of insulation, the
442 temperature-rise limit of each part shall be that of its individual thermal class.

443 **Table 2 – Limits of temperature rise for continuous and other ratings**

Part	Method of measurement	Thermal class of insulation system					
		130(B)	155(F)	180(H)	200	220	250
Stator windings Rotating field windings of synchronous motors	Resistance	130 K	155 K	180 K	200 K	220 K	250 K
Slip rings	Electrical thermometer	120 K	120 K	120 K	120 K	120 K	120 K
Cage rotors and damping windings	Electrical thermometer	The temperature rise shall not be sufficient to endanger any windings or other parts.					