



TEST REPORT

Applicant: HNC ELECTRIC LIMITED

Address of Applicant: Unit 04, 7/F., Bright Way Tower, No. 33 Mong Kok Road. KI,
Hongkong

Equipment Under Test (EUT)

Product Name: AC SERVO MOTOR

Brand Name: HNC Electric

Model No.: Please refer to pages 5 to 7

Applicable standards: EN 60034-1:2010+AC:2010

Date of sample receipt: July 17, 2020

Date of Test: July 17, 2020 To August 4, 2020

Date of report issued: May 25, 2021

Test Result : PASS

The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EU Declaration of Conformity and compliance with all relevant EU Directives.

Authorized Signature

Kevin Wang
Laboratory Manager



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TEST REPORT

EN 60034-1

Rotating electrical machines - Part 1: Rating and performance

Report reference No......: EBO2007103-E159B-1

Testing Laboratory Name: Shenzhen EBO Testing Center

Address: Building A, Qinye Business Center, Xin'an Sixth Road, 82th District, Bao'an, Shenzhen, China

Tested by (name + signature): Bernie Xia *Bernie Xia*

Approved by (name + signature): Kevin Wang *Kevin Wang*

Date of issue.....: May 25, 2021

Total number of pages.....: 42 pages



Test specification:

Standard: EN 60034-1:2010+AC:2010

Test procedure: LVD

Non-standard test method.....: N/A

Applicant's name.....: HNC ELECTRIC LIMITED

Address: Unit 04, 7/F., Bright Way Tower, No. 33 Mong Kok Road. Kl, Hongkong

Manufacturer: HNC ELECTRIC LIMITED

Address: Unit 04, 7/F., Bright Way Tower, No. 33 Mong Kok Road. Kl, Hongkong

Test item description: AC SERVO MOTOR

Brand Name: HNC Electric

Model/Type reference.....: Please refer to pages 5 to 7

Test Model No.:: S60-2-006M30

SRatings: Input: AC 220-240V, 50Hz, 6A



Test item particulars..... :	
Classification of installation and use	Mobile apparatus
Supply Connection.....	AC Mains Operated
Possible test case verdicts:	
- test case does not apply to the test object.....	N (Not Applicable)
- test object does meet the requirement.....	P (Pass)
- test object does not meet the requirement	F (Fail)
Testing..... :	
Date of receipt of test item	July 17, 2020
Date (s) of performance of tests	July 17, 2020 To August 4, 2020
General remarks:	
<p>The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory. "(see Enclosure #)" refers to additional information appended to the report. "(see appended table)" refers to a table appended to the report.</p> <p>Throughout this report a point is used as the decimal separator.</p> <p>This document is issued by the company under its General Conditions of Service accessible at www.ebotest.com. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.</p> <p>Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.</p> <p>Unless otherwise stated: (a) the results shown in this document refer only to the sample(s) tested and (b) such sample(s) are retained for 1 month. This document cannot be reproduced except in full, without prior approval of the company.</p>	
General product information:	
AC SERVO MOTOR, Power by mains, For indoor use only.	
Instructions and equipment marking related to safety is applied in the language that is acceptable in the country in which the equipment is to be sold.	

<p>Tests performed (name of test and test clause): The sample(s) tested complies with the requirements of EN 60034-1 When determining the test conclusion, the Measurement Uncertainty of test has been considered.</p>
<p>Summary of compliance with National Differences Compliance with the National requirements of CENELEC common modification.</p>
<p>Copy of Marking Plate:</p> <div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: fit-content;"> <p>Product Name: AC SERVO MOTOR Model no.: S60-2-006M30 Input: AC 220-240V, 50Hz, 6A HNC ELECTRIC LIMITED Unit 04, 7/F., Bright Way Tower, No. 33 Mong Kok Road. Kl, Hongkong</p> <div style="text-align: center;">  </div> <p>S/N: XXXXXX Importer: XXXXXX Address: XXXXXX Made In China</p> </div>

Version

Version No.	Date	Description
00	August 4, 2020	Original
01	August 13, 2020	New report* (Change Model No.)
02	September 22, 2020	Report 2 (Change Model No.)
03	May 25, 2021	New report (add Model)



Model No.:

S60-2-006M30	Sx40-2-013M30x-xx	Sx40-2-033M30x-xx
Sx60-2-006M30x-xx	Sx60-2-013M30x-xx	Sx60-2-019M30x-xx
Sx80-2-013M30x-xx	Sx80-2-024M30x-xx	Sx80-2-032M30x-xx
Sx80-2-033M30x-xx	Sx80-2-035M20x-xx	Sx80-2-035M30x-xx
Sx80-2-040M25x-xx	Sx90-2-024M30x-xx	Sx90-2-035M20x-xx
Sx90-2-040M25x-xx	Sx110-2-020M30x-xx	Sx110-2-040M20x-xx
Sx110-2-042M20x-xx	Sx110-2-042M30x-xx	Sx110-2-040M30x-xx
Sx110-2-050M30x-xx	Sx110-2-054M20x-xx	Sx110-2-054M30x-xx
Sx110-2-060M20x-xx	Sx110-2-064M20x-xx	Sx110-2-064M25x-xx
Sx110-2-060M30x-xx	Sx110-2-075M20x-xx	Sx110-2-100M20x-xx
Sx130-2-040M25x-xx	Sx130-2-048M20x-xx	Sx130-2-050M20x-xx
Sx130-2-050M25x-xx	Sx130-2-054M15x-xx	Sx130-2-054M30x-xx
Sx130-2-064M15x-xx	Sx130-2-060M25x-xx	Sx130-2-064M30x-xx
Sx130-2-075M15x-xx	Sx130-2-075M20x-xx	Sx130-2-075M30x-xx
Sx130-2-077M20x-xx	Sx130-2-077M25x-xx	Sx130-2-077M30x-xx
Sx130-2-084M15x-xx	Sx130-2-084M30x-xx	Sx130-2-096M15x-xx
Sx130-2-096M20x-xx	Sx130-2-096M25x-xx	Sx130-2-100M10x-xx
Sx130-2-100M15x-xx	Sx130-2-100M25x-xx	Sx130-2-115M15x-xx
Sx130-2-115M20x-xx	Sx130-2-146M15x-xx	Sx130-2-146M20x-xx
Sx130-2-150M15x-xx	Sx130-2-150M25x-xx	Sx150-2-150M20x-xx
Sx150-2-150M25x-xx	Sx150-2-180M20x-xx	Sx150-2-230M20x-xx
Sx150-2-270M20x-xx	Sx180-2-172M15x-xx	Sx180-2-172M25x-xx
Sx180-2-175M30x-xx	Sx180-2-190M15x-xx	Sx180-2-215M20x-xx
Sx180-2-270M10x-xx	Sx180-2-270M15x-xx	Sx180-2-270M20x-xx
Sx180-2-350M10x-xx	Sx180-2-350M15x-xx	Sx180-2-480M10x-xx
Sx180-2-480M15x-xx	Sx130-4-040M25x-xx	Sx130-4-050M25x-xx
Sx130-4-060M25x-xx	Sx130-4-077M25x-xx	Sx130-4-100M10x-xx
Sx130-4-100M15x-xx	Sx130-4-100M25x-xx	Sx130-4-150M15x-xx
Sx130-4-150M25x-xx	Sx150-4-015M25x-xx	Sx150-4-018M20x-xx
Sx150-4-023M20x-xx	Sx150-4-027M20x-xx	Sx180-4-017M15x-xx
Sx180-4-019M15x-xx	Sx180-4-021M20x-xx	Sx180-4-027M10x-xx
Sx180-4-027M15x-xx	Sx180-4-035M10x-xx	Sx180-4-035M15x-xx
Sx180-4-048M15x-xx	Sx180-4-172M15x-xx	Sx180-4-175M30x-xx



Sx180-4-190M15x-xx	Sx180-4-215M20x-xx	Sx180-4-270M10x-xx
Sx180-4-270M15x-xx	Sx180-4-350M10x-xx	Sx180-4-350M15x-xx
Sx180-4-480M15x-xx	Sx190-4-019M15x-xx	Sx190-4-019M20x-xx
Sx190-4-019M25x-xx	Sx190-4-019M30x-xx	Sx190-4-026M15x-xx
Sx190-4-026M20x-xx	Sx190-4-026M25x-xx	Sx190-4-026M30x-xx
Sx190-4-035M15x-xx	Sx190-4-035M20x-xx	Sx190-4-035M25x-xx
Sx190-4-035M30x-xx	Sx190-4-048M15x-xx	Sx190-4-048M17x-xx
Sx190-4-048M20x-xx	Sx190-4-070M15x-xx	Sx190-4-070M17x-xx
Sx190-4-070M20x-xx	Sx190-4-096M15x-xx	Sx190-4-096M17x-xx
Sx190-4-096M20x-xx	Sx190-4-118M15x-xx	Sx190-4-118M17x-xx
Sx190-4-118M20x-xx	Sx190-4-140M15x-xx	Sx190-4-140M17x-xx
Sx190-4-140M20x-xx	Sx215-4-011M17x-xx	Sx215-4-013M17x-xx
Sx215-4-015M17x-xx	Sx215-4-019M17x-xx	Sx215-4-022M17x-xx
Sx215-4-021M50x-xx	Sx215-4-025M50x-xx	Sx215-4-042M50x-xx
Sx215-4-058M50x-xx	Sx215-4-071M50x-xx	Sx215-4-096M50x-xx
Sx260-4-140M15x-xx	Sx260-4-140M17x-xx	Sx260-4-140M20x-xx
Sx260-4-190M15x-xx	Sx260-4-190M17x-xx	Sx260-4-190M20x-xx
Sx260-4-236M15x-xx	Sx260-4-236M17x-xx	Sx260-4-236M20x-xx
Sx260-4-286M15x-xx	Sx260-4-286M17x-xx	Sx260-4-286M20x-xx
Sx300-4-1000M3R5x-xx	Sx300-4-1500M3R5x-xx	Sx300-4-2500M3R5x-xx
Sx350-4-1000M3R5x-xx	Sx350-4-1500M3R5x-xx	Sx350-4-2500M3R5x-xx
Sx40-2-003M3060x-xx	Sx60-2-006M3060x-xx	Sx60-2-013M3060x-xx
Sx80-2-024M3050x-xx	Sx80-2-032M3050x-xx	Sx110-2-042M2030x-xx
Sx110-2-054M2030x-xx	Sx130-2-054M1530x-xx	Sx130-2-048M2030x-xx
Sx130-2-064M1530x-xx	Sx130-2-072M2030x-xx	Sx130-2-096M2030x-xx
Sx130-2-084M1530x-xx	Sx130-2-096M1530x-xx	Sx130-2-115M1520x-xx
Sx130-2-146M1520x-xx	Sx130-2-115M1530x-xx	Sx130-2-146M1530x-xx
Sx180-4-018M1530x-xx	Sx180-4-028M1530x-xx	Sx180-4-035M1530x-xx
Sx180-4-048M1530x-xx	Sx40-2-002M30-xx	Sx40-2-002M30B-xx
Sx40-2-002M30-xx	Sx40-2-002M30B-xx	Sx40-2-003M30-xx
Sx40-2-003M30B-xx	Sx40-2-003M30-xx	Sx40-2-003M30B-xx
Sx60-2-006L30-xx	Sx60-2-006L30B-xx	Sx60-2-006L30-xx
Sx60-2-006L30B-xx	Sx60-2-006H30-xx	Sx60-2-006H30B-xx
Sx60-2-006H30-xx	Sx60-2-006H30B-xx	Sx60-2-013L30-xx



Sx60-2-013L30B-xx	Sx60-2-013L30-xx	Sx60-2-013L30B-xx
Sx60-2-013H30-xx	Sx60-2-013H30B-xx	Sx60-2-013H30-xx
Sx60-2-013H30B-xx	Sx80-2-024L30-xx	Sx80-2-024L30B-xx
Sx80-2-024L30-xx	Sx80-2-024L30B-xx	Sx80-2-024H30-xx
Sx80-2-024H30B-xx	Sx80-2-024H30-xx	Sx80-2-024H30B-xx
Sx130-2-048M20-xx	Sx130-2-048M20B-xx	Sx130-2-048M20-xx
Sx130-2-048M20B-xx	Sx130-2-048H20-xx	Sx130-2-048H20B-xx
Sx130-2-048H20-xx	Sx130-2-048H20B-xx	Sx130-2-072M20-xx
Sx130-2-072M20B-xx	Sx130-2-072M20-xx	Sx130-2-072M20B-xx
Sx130-2-072H20-xx	Sx130-2-072H20B-xx	Sx130-2-072H20-xx
Sx130-2-072H20B-xx	Sx130-2-095M20-xx	Sx130-2-095M20B-xx
Sx130-2-095M20-xx	Sx130-2-095M20B-xx	Sx80-2-013M3060x-xx
Sx80-2-024M3060x-xx	Sx80-2-032M3060x-xx	Sx80-2-033M3060x-xx
Sx80-2-035M3060x-xx	Sx110-2-064M2030x-xx	Sx110-2-075M2030x-xx
Sx110-2-042M3040x-xx	Sx110-2-054M3040x-xx	Sx110-2-064M2540x-xx
Sx130-2-075M1530x-xx	Sx130-2-115M1530x-xx	Sx130-2-146M1530x-xx
Sx130-2-054M3040x-xx	Sx130-2-064M3040x-xx	Sx130-2-075M3040x-xx
Sx130-2-084M3040x-xx	Sx130-2-096M2540x-xx	Sx130-2-115M2040x-xx
Sx130-2-146M2040x-xx	Sx180-2-172M1520x-xx	Sx180-2-279M1520x-xx
Sx180-2-480M1520x-xx	GM6165-070CGDI4-01B000	GM6165-096CGDI4-01B000
GM6165-140CGDI4-01B000	GM6165-235CGDI4-01B000	GM6204-235CGDI4-00B000
GM6204-350CGDI4-00B000	GM6204-478CGDI4-00B000	GM6204-478CGDI5-00B000
GM6204-605CGDI4-00B000	GM6204-235CGDI4-00B001	GM6204-350CGDI4-00B001
GM6204-478CGDI4-00B001	GM6265-700CGDI4-01B000	GM6265-960CGDI4-01B000
GM6265-A18CGDI4-01B000	GM6265-A40CGDI4-01B000	GM6265-A91CGDI4-01B000
GM6165-070xxxxx-xxxxxx	GM6165-096xxxxx-xxxxxx	GM6165-140xxxxx-xxxxxx
GM6165-235xxxxx-xxxxxx	GM6204-350xxxxx-xxxxxx	GM6204-478xxxxx-xxxxxx
GM6204-605xxxxx-xxxxxx	GM6265-700xxxxx-xxxxxx	GM6265-960xxxxx-xxxxxx
GM6265-A18xxxxx-xxxxxx	GM6265-A40xxxxx-xxxxxx	GM6265-A91xxxxx-xxxxxx

Note:

1. x = A~Z (contain 26 letters), or x = 0~9 (contain 10 numbers) , or x is empty.
2. When two x in "-xx" are empty, the "-" before "xx" is also empty.

Remark: All models are identical in the same PCB layout, interior structure and electrical circuits. The only differences are the model name and appearance color for commercial purpose.



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
4	Duty		P
4.1	Declaration of duty		P
	It is the responsibility of the purchaser to declare the duty. The purchaser may describe the duty by	Duty type S1	P
	The purchaser normally cannot provide values for the moment of inertia of the motor (JM) or the relative thermal life expectancy (TL), see Annex A.		N
	Where the purchaser does not declare a duty, the manufacturer shall assume that duty type S1 (continuous running duty) applies.		P
4.2	Duty types		P
4.2.1	Duty type S1 – Continuous running duty		P
4.2.2	Duty type S2 – Short-time duty		N
4.2.3	Duty type S3 – Intermittent periodic duty 2		N
4.2.4	Duty type S4 – Intermittent periodic duty with starting 2		N
4.2.5	Duty type S5 – Intermittent periodic duty with electric braking 2		N
4.2.6	Duty type S6 – Continuous-operation periodic duty 2		N
4.2.7	Duty type S7 – Continuous-operation periodic duty with electric braking 2		N
4.2.8	Duty type S8 – Continuous-operation periodic duty with related load/speed changes 2		N
4.2.9	Duty type S9 – Duty with non-periodic load and speed variations		N
4.2.10	Duty type S10 – Duty with discrete constant loads and speeds		N
5	Rating		P
5.1	Assignment of rating		P



EN 60034-1			
Clause	Requirement-Test	Result	Verdict

	The rating, as defined in 3.2, shall be assigned by the manufacturer. In assigning the rating the manufacturer shall select one of the classes of rating defined in 5.2.1 to 5.2.6. The designation of the class of rating shall be written after the rated output. If no designation is stated, rating for		P
	When accessory components (such as reactors, capacitors, etc.) are connected by the manufacturer as part of the machine, the rated values shall refer to the supply terminals of the	No such accessory components provided	N
	Special considerations are required when assigning ratings to machines fed from or supplying static converters. IEC 60034-17 gives guidance for the case of cage induction motors		N
5.2	Classes of rating		P
5.2.1	Rating for continuous running duty		P
	A rating at which the machine may be operated for an unlimited period, while complying with the requirements of this standard.		P
	This class of rating corresponds to duty type S1 and is designated as for the duty type S1.		P
5.2.2	Rating for short-time duty		N
	A rating at which the machine may be operated for a limited period, starting at ambient temperature, while complying with the requirements of this		N
	This class of rating corresponds to duty type S2 and is designated as for the duty type S2.		N
5.2.3	Rating for periodic duty		N
	A rating at which the machine may be operated on duty cycles, while complying with the requirements of this standard.		N
	This class of rating corresponds to one of the periodic duty types S3 to S8 and is designated as for the corresponding duty type.		N



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
	Unless otherwise specified, the duration of a duty cycle shall be 10 min and the cyclic duration factor shall be one of the following values:		N
5.2.4	Rating for non-periodic duty		N
	A rating at which the machine may be operated non-periodically while complying with the		N
	This class of rating corresponds to the non-periodic duty type S9 and is designated as for the duty type S9.		N
5.2.5	Rating for duty with discrete constant loads and speeds		N
	A rating at which the machine may be operated with the associated loads and speeds of duty type S10 for an unlimited period of time while complying with the requirements of this standard. The maximum permissible load within one cycle shall take into consideration all parts of the machine, for example, the insulation system regarding the validity of the exponential law for the relative thermal life expectancy, bearings with respect to temperature, other parts with respect to thermal expansion. Unless specified in other relevant IEC standards, the maximum load shall not exceed 1,15 times the value of the load based on duty type S1. The minimum load may have the value zero, the machine operating at no-load or being de-energized and at rest. Considerations for the		N
	This class of rating corresponds to the duty type S10 and is designated as for the duty type S10.		N
5.2.6	Rating for equivalent loading		N
	A rating, for test purposes, at which the machine may be operated at constant load until thermal equilibrium is reached and which results in the same stator winding temperature rise as the average temperature rise during one load cycle of		N
	This class of rating, if applied, is designated 'equ'.		N



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
5.3	Selection of a class of rating		P
	A machine manufactured for general purpose shall have a rating for continuous running duty and be capable of performing duty type S1.		P
	If the duty has not been specified by the purchaser, duty type S1 applies and the rating assigned shall be a rating for continuous running duty.		P
	When a machine is intended to have a rating for short-time duty, the rating shall be based on duty		N
	When a machine is intended to supply varying loads or loads including a time of no-load or times where the machine will be in a state of de-energized and at rest, the ratings shall be a rating for periodic duty based on a duty type selected from duty types S3 to S8, see 4.2.3 to		N
	When a machine is intended non-periodically to supply variable loads at variable speeds, including overloads, the ratings shall be a rating for non-periodic duty based on duty type S9, see		N
	When a machine is intended to supply discrete constant loads including times of overload or times of no-load (or de-energized and at rest) the ratings shall be a rating with discrete constant loads based		N
5.4	Allocation of outputs to class of rating		P
	In the determination of the rating		P
	For duty types S1 to S8, the specified value(s) of the constant load(s) shall be the rated output(s), see 4.2.1 to 4.2.8		P
	For duty types S9 and S10, the reference value of the load based on duty type S1 shall be taken as the rated output, see 4.2.9 and 4.2.10.		N
5.5	Rated output		P
5.5.1	DC generators	Motor	N
	The rated output is the output at the terminals and shall be expressed in watts (W).		N
5.5.2	AC generators		N



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
	The rated output is the apparent power at the terminals and shall be expressed in voltamperes		N
	The rated power factor for synchronous generator shall be 0,8 lagging (over-excited), unless		N
5.5.3	Motors		P
	The rated output is the mechanical power available at the shaft and shall be expressed in watts (W).		P
5.5.4	Synchronous condensers	No such condensers used	N
	The rated output is the reactive power at the terminals and shall be expressed in volt-amperes reactive (var) in leading (under-excited) and		N
5.6	Rated voltage		P
5.6.1	DC generators		N
	For d.c. generators intended to operate over a relatively small range of voltage, the rated output and current shall apply at the highest voltage of the		N
5.6.2	AC generators		N
	For a.c. generators intended to operate over a relatively small range of voltage, the rated output and power factor shall apply at any voltage within		N
5.7	Co-ordination of voltages and outputs		N
	It is not practical to build machines of all ratings for all rated voltages. In general, for a.c. machines, based on design and manufacturing considerations, preferred voltage ratings above 1kV in terms of rated output are as shown in Table 1.		N
5.8	Machines with more than one rating	Only single rating provided	N
	For machines with more than one rating, the machine shall comply with this standard in all		N
	For multi-speed motors, a rating shall be assigned for each speed.		N



EN 60034-1			
Clause	Requirement-Test	Result	Verdict

	When a rated quantity (output, voltage, speed, etc.) may assume several values or vary continuously within two limits, the ratings shall be stated at these values or limits. This provision does not apply to voltage and frequency variations during operation as defined in 7.3 or to star-delta connections intended for starting.		N
6	Site operating conditions		P
6.1	General		P
	Unless otherwise specified, machines shall be suitable for the following site operation conditions. For site operating conditions deviating from those values, corrections are given in Clause		P
6.2	Altitude		P
	The altitude shall not exceed 1 000 m above sea-level.		P
6.3	Maximum ambient air temperature		P
	The ambient air temperature shall not exceed 40°C.	Ambient not exceed 40 °C.	P
6.4	Minimum ambient air temperature		P
	The ambient air temperature shall not be less than -15 °C for any machine.	Ambient not exceed -15 °C.	P
	The ambient air temperature shall be not less than 0°C for a machine		N
6.5	Water coolant temperature	Air temperature	N
	The water coolant temperature at the inlet to a machine or heat exchanger, or the ambient water (in the case of submersible machines with surface cooling or machines with water jacket cooling) shall		N
6.6	Storage and transport		P
	When temperatures lower than specified in 6.4 are expected during transportation, storage, or after installation, the purchaser shall inform the manufacturer and specify the expected minimum		P
6.7	Purity of hydrogen coolant		N



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
	Hydrogen-cooled machines shall be capable of operating at rated output under rated conditions with a coolant containing not less than 95 %		N
	For calculating efficiency in accordance with IEC 60034-2, the standard composition of the gaseous mixture shall be 98 % hydrogen and 2% air by volume, at the specified values of pressure and temperature of the cooled gas, unless otherwise agreed. Windage losses shall be calculated at the corresponding density.		N
7	Electrical operating conditions		P
7.1	Electrical supply		P
	For three-phase a.c. machines, 50 Hz or 60 Hz, intended to be directly connected to distribution or utilisation systems, the rated voltages shall be derived from the nominal voltages given in IEC 60038.		N
	For a.c. motors supplied from static converters these restrictions on voltage, frequency and waveform do not apply. In this case, the rated		P
7.2	Form and symmetry of voltages and currents		P
7.2.1	AC motors		P
7.2.1.1	AC motors rated for use on a power supply of fixed frequency, supplied from an a.c. generator (whether local or via a supply network) shall be suitable for operation on a supply voltage having a harmonic voltage factor (HVF) not		P
	0,02 for single-phase motors and three-phase motors, including synchronous motors but excluding motors of design N (see IEC 60034-12),		P
	0,03 for design N motors.		N



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
	Three-phase a.c. motors shall be suitable for operation on a three-phase voltage system having a negative-sequence component not exceeding 1% of the positive-sequence component over long period, or 1,5 % for a short period not exceeding a few minutes, and a zero-sequence component not exceeding 1% of		N
	Should the limiting values of the HVF and of the negative-sequence and zero-sequence components occur simultaneously in service at the rated load, this shall not lead to any harmful temperature in the motor and it is recommended that the resulting excess temperature rise related to the limits specified in this standard should be		N
7.2.1.2	AC motors supplied from static converters have to tolerate higher harmonic contents of the supply voltage, see IEC 60034-17 for the case of cage motors within the scope of IEC 60034-12.		P
7.2.2	AC generators		N
	Three-phase a.c. generators shall be suitable for supplying circuits which, when supplied by a system of balanced and sinusoidal voltages:		N
	Should the limits of deformation and imbalance occur simultaneously in service at the rated load, this shall not lead to any harmful temperature in the generator and it is recommended that the resulting excess temperature rise related to the limits specified in this standard should		N
7.2.3	Synchronous machines	Asynchronous machines	N



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
	Unless otherwise specified, three-phasesynchronousmachinesshall be capable ofoperating continuously on an unbalanced systemin sucha way that, with none of the phasecurrentsexceeding the ratedcurrent, the ratio of thenegative-sequence component of current (I ₂)tothe ratedcurrent (I _N) doesnot exceed the valuesin Table2 and under fault conditionsshall be capable ofoperationwith the productof (I ₂ /I _N) ² andtime(t) not exceedingthevalues inTable2.		N
7.2.4	DC motors supplied from static powerconverters		N
	Inthe case of ad.c. motor supplied froma staticpower converter, the pulsating voltage and currentaffect the performance of the machine.Lossesandtemperaturerisewillincreaseandthe commutationismore difficult compared with ad.c. motor		N
	It is necessary, therefore, formotors with aratedoutput exceeding 5 kW, intended for supply fromastatic power converter, to be designed foroperation from a specifiedsupply, and,ifconsidered necessary by themotor manufacturer,for an external inductanceto be provided for		N
	The staticpowerconverter supply shallbecharacterizedbymeansof an identificationcode,		N
	Motors with rated output not exceeding5 kW,instead of being tiedtoa specific type of staticpowerconverter,maybedesignedforusewithan ystatic power converter, withor without externalinductance, provided thattherated formfactorforwhich the motor is designed will not be surpassedand thatthe insulation level of the motor armaturecircuit is appropriate for therated alternating voltage at the input terminals ofthestatic power converter.		N



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
	In all cases, the undulation of the static power converter output current is assumed to be so low as to result in a current tripping factor no higher than 0,1 at rated conditions.		N
7.3	Voltage and frequency variations during operation		P
	For a.c. machines rated for use on a power supply of fixed frequency supplied from an a.c. generator (whether local or via a supply network), combinations of voltage variation and frequency variation are classified as being either zone A or zone B, in accordance with Figure 11 for generators and synchronous condensers, and Figure 12 for motors.		P
	For d.c. machines, when directly connected to a normally constant d.c. bus, zones A and B apply only to the voltages.		N
	A machine shall be capable of performing its primary function, as specified in Table 3, continuously within zone A, but need not comply fully with its performance at rated voltage and frequency (see rating point in Figures 11 and 12), and may exhibit some deviations. Temperature rises may be higher than at rated voltage and		P
	A machine shall be capable of performing its primary function within zone B, but may exhibit greater deviations from its performance at rated voltage and frequency than in zone A. Temperature rises may be higher than at rated voltage and frequency and most likely will be higher than those in zone A. Extended operation at the perimeter of zone B is not recommended.		N
7.4	Three-phase a.c. machines operating on unearthed systems		N



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
	Three-phase a.c. machines shall be suitable for continuous operation with the neutral at or near earth potential. They shall also be suitable for operation on ungrounded systems with one line at earth potential for infrequent periods of short duration, for example as required for normal fault clearance. If it is intended to run the machine continuously or for prolonged periods in this condition, a machine with a level of insulation suitable for this condition will be		N
	If the winding does not have the same insulation at the line and neutral ends, this shall be stated by the manufacturer.		N
7.5	Voltage (peak and gradient) withstand levels		N
	For a.c. motors the manufacturer shall declare a limiting value for the peak voltage and for the voltage gradient in continuous operation.		N
	For cage induction motors within the scope of IEC 60034-12, see also IEC 60034-17.		N
	For high-voltage a.c. motors, see also IEC 60034-15.		N
8	Thermal performance and tests		P
8.1	Thermal class	According to IEC 60034-18	P
	A thermal class in accordance with IEC 62114 shall be assigned to the insulation systems used in machines.		P
	It is the responsibility of the manufacturer of the machine to interpret the results obtained by thermal endurance testing according to the appropriate part of IEC 60034-18.		P
8.2	Reference coolant		N
	The reference coolant for a given method of cooling the machine is specified in Table 4.		N
	If a third coolant is used, temperature rise shall be measured above the temperature of the primary or		N
8.3	Conditions for thermal tests		P
8.3.1	Electrical supply		P



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
	During thermal testing of an a.c. motor the HVF of the supply shall not exceed 0,015 and the negative-sequence component of the system of voltages shall be less than 0,5 % of the positive-sequence component, the influence of the zero-sequence component being eliminated.		P
	By agreement, the negative-sequence component of the system of currents may be measured instead of the negative-sequence component of the system of voltages. The negative sequence component of the system of currents shall not exceed 2,5 % of the positive sequence		N
8.3.2	Temperature of machine before test		P
	If the temperature of a winding is to be determined from the increase of resistance, the initial winding temperature shall not differ from the coolant by		N
	When a machine is to be tested on a short-time rating (duty type S2) its temperature at the beginning of the thermal test shall be within 5K of		P
8.3.3	Temperature of coolant		N
	A machine may be tested at any convenient value of coolant temperature. See Table 11 (for indirect cooled windings) or Table 14 (for direct cooled		N
8.3.4	Measurement of coolant temperature during test		N
	The value to be adopted for the temperature of a coolant during a test shall be the mean of the readings of the temperature detectors taken at equal intervals of time during the last quarter of the duration of the test. To reduce errors due to the time lag of the change of temperature of large machines following variations in the temperature of the coolant, all reasonable precautions shall be taken to minimize such		N



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
8.3.4.1	Open machines or closed machines without heat exchangers (cooled by surrounding ambient air or gas)		N
	The temperature of the ambient air or gas shall be measured by means of several detectors placed at different points around and halfway up the machine at 1 m to 2 m from it. Each detector shall be protected from radiant heat and draughts.		N
8.3.4.2	Machines cooled by air or gas from a remote source through ventilation ducts and machines with separately mounted heat exchangers		N
	The temperature of the primary coolant shall be measured where it enters the machine.		
8.3.4.3	Closed machines with machine-mounted or internal heat exchangers		N
	The temperature of the primary coolant shall be measured where it enters the machine. The temperature of the secondary coolant shall be		N
8.4	Temperature rise of a part of a machine		P
	The temperature rise, $\Delta\theta$, of a part of a machine is the difference between the temperature of that part measured by the appropriate method in accordance with 8.5, and the temperature of the coolant measured in accordance with 8.3.4.		P
	For comparison with the limits of temperature rise (see Table 7 or 8) or of temperature (see Table 12), when possible, the temperature shall be measured immediately before the machine is shutdown at the end of the thermal test, as described in		N
	When this is not possible, for example, when using the direct measurement of resistance method, see		N
	For machines tested on actual periodic duty (duty types S3 to S8) the temperature at the end of the test shall be taken as that at the middle of the period causing the greatest heating in the last cycle of operation (but see also 8.7.3).		N



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
8.5	Methods of measurement of temperature		P
8.5.1	General		P
	Three methods of measuring the temperature of windings and other parts are recognized:		N
	Different methods shall not be used as a check upon one another.		N
	For indirect testing see IEC 61986.		P
8.5.2	Resistance method		P
	The temperature of the windings is determined from the increase of the resistance of the windings.	See append table	P
8.5.3	Embedded temperature detector (ETD) method	Resistance method	N
	The temperature is determined by means of temperature detectors (e.g. resistance thermometers, thermocouples or semiconductor negative coefficient detectors) built into the machine during construction, at points which are		N
8.5.4	Thermometer method		N
	The temperature is determined by thermometers applied to accessible surfaces of the completed machine. The term 'thermometer' includes not only bulb-thermometers, but also non-embedded thermocouples and resistance thermometers. When bulb-thermometers are used in places where there is a strong varying or moving magnetic field, alcohol thermometers shall be used in		N
8.6	Determination of winding temperature		P
8.6.1	Choice of method		P
	In general, for measuring the temperature of the windings of a machine, the resistance method in accordance with 8.5.1 shall be applied (but see also 8.6.2.3.3).		P
	For a.c. stator windings of machines having a rated output of 5 000 kW (or kVA) or more the ETD method shall be used.		N



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
	For a.c. machines having a rated output less than 5000 kW (or kVA) but greater than 200 kW (or kVA) the manufacturer shall choose either the resistance or the ETD method, unless otherwise agreed.		N
	For a.c. machines having a rated output less than or equal to 200 kW (or kVA) the manufacturer shall choose the direct measurement version or the superposition version of the resistance method (see 8.6.2.1), unless otherwise agreed (but see also below).		N
	For machines having a rated output less than or equal to 600 W (or VA), when the windings are non-uniform or severe complications are involved in making the necessary connections, the temperature may be determined by means of thermometers. Temperature rise limits in accordance with Table 7, item 1d for resistance method shall apply.		N
	The thermometer method is recognized in the following cases:		N
	For a.c. stator windings having only one coil-side per slot, the ETD method shall not be used for verifying compliance with this standard: the resistance method shall be used.		N
	For other windings having one coil-side per slot and for end windings the ETD method shall not be used for verifying compliance with this standard.		N
	For windings of armatures having commutators and for field windings the resistance method and the thermometer method are recognized. The resistance method is preferred for stationary field windings of d.c. machines having more than one layer		N
8.6.2	Determination by resistance method		P
8.6.2.1	Measurement		P
	One of the following methods shall be used:		P
8.6.2.2	Calculation	The value see append table	P
8.6.2.3	Correction for stopping time		N
8.6.2.3.1	General		N



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
	The measurement of temperatures at the end of the thermal test by the direct measurement resistance method requires a quick shutdown. A carefully planned procedure and an adequate		N
8.6.2.3.2	Short stopping time		N
	If the initial resistance reading is obtained within the time interval specified in Table 5, that reading shall be accepted for the temperature measurement.		N
8.6.2.3.3	Extended stopping time		N
	If a resistance reading cannot be made in the time intervals specified in Table 5, it shall be made as soon as possible but not after more than twice the intervals specified in Table 5, and additional readings shall be taken at intervals of approximately 1 min until these readings have begun a distinct decline from their maximum value. A curve of these readings shall be plotted as a function of time and extrapolated to the appropriate time interval of Table 5 for the rated output of the machine. A semi-logarithmic plot is recommended where temperature is plotted on the logarithmic scale. The value of temperature thus obtained shall be considered as the temperature at shutdown. If successive measurements show increasing		N
	If a resistance reading cannot be made until after twice the time interval specified in Table 5, this method of correction shall only be used by agreement		N
8.6.2.3.4	Windings with one coil-side per slot		N



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
	For machines with one coil-side per slot, the resistance method by direct measurement may be used if the machine comes to rest within the time interval specified in Table 5. If the machine takes more than 90 s to come to rest after switching off the power, the superposition method may be used if previously agreed.		N
8.6.3	Determination by ETD method		N
8.6.3.1	General		N
	The detectors shall be suitably distributed throughout the winding and the number of		N
	All reasonable efforts, consistent with safety, shall be made to place the detectors at the points where the highest temperatures are likely to occur, in such a manner that they are effectively protected against contact with the primary coolant.		N
	The highest reading from the ETD elements shall be used to determine the temperature of the winding.		N
8.6.3.2	Two or more coil-sides per slot		N
	The detectors shall be located between the insulated coil-sides within the slot in positions at which the highest temperatures are likely to occur.		N
8.6.3.3	One coil-side per slot		N
	The detectors shall be located between the wedge and the outside of the winding insulation in positions at which the highest temperatures are likely to occur, but see also 8.6.1.		N
8.6.3.4	End windings		N
	The temperature detectors shall be located between two adjacent coil-sides within the end windings in positions where the highest temperatures are likely to occur. The sensing point of each detector shall be in close contact with the surface of a coil-side and be adequately protected against the influence of the coolant, but see also 8.6.1.		N
8.6.4	Determination by thermometer method	Resistance method	N



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
	All reasonable efforts, consistent with safety, shall be made to place thermometers at the point, or points where the highest temperatures are likely to occur (e.g. in the end windings close to the core iron) in such a manner that they are effectively protected against contact with the primary coolant and are in good thermal contact with the winding or other part of the machine.		N
	The highest reading from any thermometers shall be taken to be the temperature of the winding or other part of the machine.		N
8.7	Duration of thermal tests		P
8.7.1	Rating for continuous running duty		P
	The test shall be continued until thermal equilibrium has been reached.		P
8.7.2	Rating for short-time duty		N
	The duration of the test shall be the time given in the rating.		N
8.7.3	Rating for periodic duty		N
	Normally the rating for equivalent loading assigned by the manufacturer (see 5.2.6) shall be applied until thermal equilibrium has been reached. If at the end of the actual duty is agreed, the load cycles specified shall be applied and continued until practically identical temperature cycles are obtained. The criterion for this shall be that a straight line between the corresponding points of successive duty cycles on a temperature plot has a gradient of less than 2K per hour. If necessary, measurements shall be		N
8.7.4	Ratings for non-periodic duty and for duty with discrete constant loads		N
	The rating for equivalent loading assigned by the manufacturer (see 5.2.6) shall be applied until thermal equilibrium has been reached.		N
8.8	Determination of the thermal equivalent time constant for machines of duty type S9		N



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
	The thermal equivalent time constant with ventilation as in normal operating conditions, suitable for approximate determination of the temperature course, can be determined from the cooling curve plotted in the same manner as in 8.6.2.3. The value of the time constant is 1,44 times (that is to say, $1/\ln(2)$ times) the time taken by the machine to cool to one-half of the full load temperature rise, after its		N
8.9	Measurement of bearing temperature		N
	Either the thermometer method or the ETD method may be used.		N
	The measuring point shall be as near as possible to one of the two locations specified in Table 6.		N
	The thermal resistance between the temperature detector and the object whose temperature is to be measured shall be minimized; for example, air gaps shall be packed with thermally conducting		N
8.10	Limits of temperature and of temperature rise		P
	Limits are given for operation under site operating conditions specified in Clause 6 and at rating for continuous running duty (reference conditions), followed by rules for the adjustment of those limits when operating at site under other conditions and on other ratings. Further rules give adjustments to the limits during thermal testing when conditions at the test site differ from those at the operating site.		P
	The limits are stated relative to the reference coolant specified in Table 4.		P
	A rule is given to allow for the purity of hydrogen coolant.		N
8.10.1	Indirect cooled windings		P
	Temperature rises under reference conditions shall not exceed the limits given in Table 7 (air coolant) or Table 8 (hydrogen coolant)		P



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
	For other operating site conditions, for ratings other than continuous running duty, and for rated voltages greater than 12 000 V, the limits shall be adjusted according to Table 9. (See also Table 10 for limit on coolant temperature which is assumed in Table 9.)		N
	In the case of thermometer readings made in accordance with 8.6.1, the limit of temperature rise		P
	If, for windings indirectly cooled by air, conditions at the test site differ from those at the operating site, the adjusted limits given in Table 11 shall		P
	If the adjusted limits given in Table 11 lead to permissible temperatures at the test site which the manufacturer considers to be excessive, the testing procedure and the limits shall be agreed.		N
	No adjustments at the test site are given for windings indirectly cooled by hydrogen, because it is very unlikely that they will be tested at rated load anywhere other than at the operating site.		N
8.10.2	Direct cooled windings		N
	Temperatures under reference conditions shall not exceed the limits given in Table 12.		N
	For other operating site conditions the limits shall be adjusted according to Table 13.		N
	If conditions at the test site differ from those at the operating site, the adjusted limits given in Table 14		N
	If the adjusted limits given in Table 14 lead to temperatures at the test site which the manufacturer considers to be excessive, the testing procedure and the limits shall be agreed.		N
8.10.3	Adjustments to take account of hydrogen purity on test		N
	For windings directly or indirectly cooled by hydrogen, no adjustment shall be made to limits of temperature rise or of total temperature if the proportion of hydrogen in the coolant is between 95 % and 100 %.		N



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
8.10.4	Permanently short-circuited windings, magneticcores and allstructural components (otherthan bearings) whether or not in contact with insulation		N
	The temperature rise or thetemperature shall notbe detrimentaltothe insulation of that part or to any other part adjacent to it.		N
	Commutatorsand sliprings, open or enclosed and their brushes and brushgear		N
	The temperature rise or temperatureofanycommutator,slipring, brush or brushgear shall notbe detrimentaltothe insulation of that part or any		N
	The temperature rise or temperatureofacommutator orslipringshallnot exceed that atwhich the combination ofbrush grade andcommutator orslipring material can handle the		N
9	Other performance andtests		P
9.1	Routine tests		P
	Routine testsare always factory tests. Theycanonly be performed on machineswhich areassembled atthe works of the manufacturer. Themachineneed not be completely assembled. It canlack components which are not significant forthetesting. Routine tests do not need the machine tobe coupled except fortheopen-circuit teston synchronousmachines.		P
	The minimumtest schedule islisted in Table 15and is applicable for machineswith rated output≤20 MW (MVA). Additional routine tests may beperformed especially on machineswith ratingsabove 200 kW (kVA). Thetermsynchronous machinesincludes permanent magnet machines.		P
9.2	Withstand voltage test		P



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
	A test voltage, as specified below, shall be applied between the windings under test and the frame of the machine, with the core and the windings not under test connected to the frame. It shall be applied only to a new and completed machine with all its parts in place under conditions equivalent to normal working conditions and shall be carried out at the manufacturer's works or after erection on site. When a thermal test is carried out, the withstand voltage test shall be carried out	See append table	P
	In the case of polyphase machines with rated voltage above 1kV having both ends of each phase individually accessible, the test voltages shall be applied between each phase and the frame, with the core and the other phases and windings		N
	Except as stated below, the test voltages shall be of power frequency and as near as possible to a sine waveform. The final value of the voltages shall be in accordance with Table 16. However, for machines with a rated voltage 6kV or greater, when power frequency equipment is not available, then by agreement a d.c. test may be carried out at a voltage 1,7 times the r.m.s. value given in Table 16.		N
	The test shall be commenced at a voltage not exceeding half of the full test voltage. The voltages shall then be increased to the full value, steadily or in steps of not more than 5% of the full value, the time allowed for the voltage increase from half to full value being not less than 10 s. The full test voltage shall then be maintained for 1 min in accordance with the value as specified in Table 16. There shall be no failure (see IEC 60060-1) during this period.		N



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
	During the routine testing of quantity produced machines up to 200 kW (or kVA) and rated for UN ≤ 1 kV, the 1 min test may be replaced by a test of 1s at 120 % of the test voltage specified in Table		N
	The withstand voltage test at full voltage made on the windings on acceptance shall not be repeated. If, however, a second test is made at the request of the purchaser, after further drying if considered necessary, the test voltage shall be 80 % of the		P
	To determine the test voltage from Table 16 for d.c. motors supplied by static power converters, the direct voltage of the motor or the r.m.s. phase-to-phase value of the rated alternating voltage at the input terminals of the static power converter shall be used, whichever is the greater.		N
	Completely rewound windings shall be tested at the full test voltage for new machines		N
	When a user and a repair contractor have agreed to carry out withstand voltage tests in cases where windings have been partially rewound or in the case of an overhauled machine, the following		N
9.3	Occasional excess current		P
9.3.1	General		P



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
	<p>The excess current capability of rotating machines given for the purpose of co-ordinating these machines with control and protective devices.</p> <p>Tests to demonstrate these capabilities are not a requirement of this standard. The heating effect in the machine windings varies approximately as the product of the time and the square of the current. A current in excess of the rated current will result in increased temperature. Unless otherwise agreed, it can be assumed that the machine will not be operated at the excess currents specified for more than a few short periods during the lifetime of the machine. When an a.c. machine is to be used as both a generator and a motor, the excess current</p>		P
9.3.2	Generators		N
	AC generators having rated outputs not exceeding 1 200 MVA shall be capable of withstanding a current equal to 1,5 times the rated current for not less than 30s.		N
	AC generators having rated outputs above 1 200 MVA shall be capable of withstanding a current equal to 1,5 times the rated current for a period which shall be agreed, but this period shall be not		N
9.3.3	Motors (except commutator motors and permanent magnet motors)		P
	Polyphase motors having rated outputs not exceeding 315kW and rated voltages not exceeding 1kV shall be capable of		N
9.3.4	Commutator machines		N
	A commutator machine shall be capable of withstanding, for 60 s, 1,5 times rated current under the appropriate combination of conditions as		N
9.4	Momentary excess torque for motors		P
9.4.1	Polyphase induction motors and d.c. motors		P



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
	Motors, whatever their duty and construction, shall be capable of withstanding an excess torque of at least 60 % of their rated torque for 15s without either stalling or exhibiting an abrupt change of speed (under gradual increase of torque). The voltage and frequency (for induction motors) shall be maintained at their rated values.		P
	For d.c. motors, the torque shall be expressed in terms of overload current.		N
	Motors for duty type S9 shall be capable of withstanding momentarily an excess torque		N
	Motors intended for specific applications that require a high torque (for example for hoisting) shall be the subject of agreement.		N
	For cage-type induction motors specially designed to ensure a starting current of less than 4,5 times the rated current, the excess torque can be below the value of 60% given in paragraph 1, but not less		N
	In the case of special types of induction motors with special inherent starting properties, for example motors intended for use at variable frequency or induction motors supplied from static converters, the value of the excess torque shall be the subject of agreement.		N
9.4.2	Polyphase synchronous motors		N
	Unless otherwise agreed, a polyphase synchronous motor, irrespective of the duty, shall be capable of withstanding an excess torque as specified below for 15s without falling out of synchronism, the excitation being maintained at the value corresponding to rated load. When automatic excitation is used, the limits of torque shall be the same values with the excitation		N
9.4.3	Other motors		N



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
	The momentary excess torque for single-phase, commutator and other motors shall be the subject		N
9.5	Pull-up torque		P
9.6	Safe operating speed of cage induction motors		P
	All three-phase single-speed cage induction motors of frame number up to and including 315 and for voltages up to and including 1 000 V shall be capable of safe continuous operation at speeds up to the appropriate speed given in Table 17 unless otherwise stated on the rating plate.		N
9.7	Overspeed		P
	Machines shall be designed to withstand the speeds specified in Table 18.		P
	An overspeed test is not normally considered necessary but can be performed when this is specified and has been agreed. (For turbine-type a.c. generators, see also IEC 60034-3.) An overspeed test shall be considered as satisfactory if no permanent abnormal deformation is apparent subsequently, and no other weakness is detected which would prevent the machine from operating normally, and provided the rotor windings after the test comply		P
	Due to settling of laminated rotor rims, laminated poles held by wedges or by bolts, etc. a minute permanent increase in the diameter is natural, and not to be considered as an abnormal deformation indicating that the machine is not suitable for		N
	During commissioning of a hydraulic-turbine driven synchronous generator, the machine shall be driven at the speed it can reach with the overspeed protection operating, so as to ascertain		N
9.8	Short-circuit current for synchronous machines		N



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
	Unless otherwise specified, the peak value of the short-circuit current for synchronous machines, including turbine-type machines not covered by IEC 60034-3, in the case of short circuit on all phases during operation at rated voltage, shall not exceed 15 times the peak value or 21		N
	Verification may be carried out by calculation or by means of a test at a voltage of 0,5 times the rated voltage or above.		P
9.9	Short-circuit withstand test for synchronous machines		N
	The three-phase short-circuit test for synchronous machines shall be carried out only at the request of the purchaser. In this case, the test shall be carried out on the machine running on no-load with an excitation corresponding to the rated voltage unless otherwise agreed. The test shall not be carried out with an excitation greater than that corresponding to 1,05 times the		N
	The test excitation, as determined, may be reduced by agreement, in order to take into account the impedance of the transformer which may be placed between the machines and the system. In this latter case, it may also be agreed that the test be made at the operating site with the over-excitation device in operation. The short circuit shall be maintained for 3s.		N
	The test is considered satisfactory if no harmful deformation occurs and if the requirements of the applied voltage dielectric test (see Table 16) are met after the short-circuit test. For three phase		N
9.10	Commutation test for commutator machines		N



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
	Ad.c. or a.c. commutator machine shall be capable of operating from no-load to operation with the excess current or excess torque, specified in 9.3 and 9.4 respectively, without permanent damage to the surface of the commutator or brushes and without injurious sparking, the brushes remaining in the same set position. If possible, the commutation test shall be		N
9.11	Total Harmonic Distortion (THD) for synchronous machines		N
9.11.1	General		N
	The requirements of this subclause apply only to synchronous machines having rated outputs of 300 kW (or kVA) or more, intended for connection to power networks operating at nominal frequencies of 16 2/3 Hz to 100 Hz inclusive, with a view to minimizing interference caused by the machines.		N
9.11.2	Limits		N
	When tested on open-circuit and at rated speed and voltage, the total harmonic distortion (THD) of the line-to-line terminal voltage, as measured according to the methods laid down in 9.11.3, shall not exceed 5 %.		N
9.11.3	Tests		N
	Type tests shall be carried out on a.c. machines to verify compliance with 9.11.2. The range of frequencies measured shall cover all harmonics		N
	Either the THD may be measured directly by means of a meter and associated network specially designed for the purpose, or each individual harmonic shall be measured and from the measured values the THD shall be computed using the following formula:		N
10	Rating plates		P
10.1	General		P
	Electrical machine shall be provided with a rating plate(s). The plate(s) shall be made of durable		P



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
	The rating plate(s) shall preferably be mounted on the frame of the machine and be located so as to be easily legible in the position of use determined by the type of construction and mounting arrangement of the machine. If the electrical machine is enclosed or incorporated in the equipment that its rating plate is not easily legible, the manufacturer shall, on request, supply a		P
10.2	Marking		P
	Machines with rated outputs up to and including 750W (or VA) and dimensions not covered by IEC 60072 shall be marked with the information given in items 1, 2, 11, 12 and 26 below as a minimum. For special-purpose and built-in machines with rated outputs up to and including 3kW (or kVA) items 1, 2, 11 and 12 shall be marked as a minimum		P
	In all other cases, rating plate(s) shall be durably marked with the items in the following list. The items need not all be on the same plate. Letter symbols for units and quantities shall be in accordance with IEC 60027-1 and IEC 60027-4.		P
	If the manufacturer gives more information, this need not necessarily be marked on the rating plate(s).		P
	The items are numbered for convenient reference, but the order in which they appear on the rating plate(s) is not standardized. Items may be suitably		P
11	Miscellaneous requirements		N
11.1	Protective earthing of machines		N
	Machines shall be provided with an earthing terminal or another device to permit the connection		N
	The symbol or legend shall identify this device. However, machines shall neither be earthed nor be		N



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
	Inthecase of machines havingrated voltagesgreater than50 Va.c. or 120 Vd.c., but notexceeding1000Va.c.or1500Vd.c.,theterminalfort heearthing conductorshall be situated inthevicinity of the terminals for the line conductors,beingplacedin the terminal box, if one is provided.Machineshaving rated outputs in excess of 100kW(orkVA)shall have in addition an earthing terminalfitted on the frame.		N
	Machines forrated voltages greater than 1000V a.c. or 1 500 Vd.c. shall have an earthing terminalontheframe,forexampleanironstrap, andinaddition, a means inside the terminal box forconnecting aconducting cablesheath, if any.		N
	Theearthingterminalshallbe designed to ensurea goodconnection with theearthing conductor without any damage tothe conductor orterminal.Accessibleconducting parts which arenot part of the operating circuitshall have goodelectricalcontact with eachother and with theearthing terminal. When all bearingsandtherotorwinding ofa machine are insulated, theshaft shall be electricallyconnectedtotheearthingterminal,unless the manufacturerandthe purchaser agree toalternative means of		N
	When an earthing terminalis provided intheterminalbox, it shall be assumed that theearthingconductor ismade of the same metal as the live		N
	When an earthing terminalis provided on theframe,theearthing conductor may, byagreement, be made of another metal (forexample, steel). Inthis case, in designingthe terminal, proper consideration shall be given tothe		N



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
	The earthing terminal shall be designed to accommodate an earthing conductor of cross-sectional area in accordance with Table 19. If an earthing conductor larger than the size given in the Table is used, it is recommended that it should correspond as nearly as possible to one of the		N
	For other cross-sectional areas of live conductors, the earthing or protective conductor shall have a cross-sectional area at least equivalent to:		N
11.2	Shaft-end key(s)		N
	When a machine shaft end is provided with one or more keyways, shall be provided with a full key of normal shape and length.		N
	When a machine shaft end is provided with one or more keyways, shall be provided with a full key of normal shape and length.		N
12	Tolerances		P
12.1	General		P
	Unless stated otherwise, tolerances on declared values shall be as specified in Table 20.		P
13	Electromagnetic compatibility (EMC)	Refer to EMC relevant report	N
13.1	General		N
	The following requirements apply to rotating electrical machines with rated voltages not exceeding 1000 V a.c. or 1 500 V d.c. and which are intended for operation in industrial environments.		N
	Electronic components mounted inside a rotating electrical machine and which are essential for its operation (for example rotating excitation devices)		N
	Electronic components mounted inside a rotating electrical machine and which are essential for its operation (for example rotating excitation devices)		N
	The requirements of this clause apply to machines that are supplied directly to the end-user.		N
	Transients (such as starting) are not covered by this clause.		N



EN 60034-1			
Clause	Requirement-Test	Result	Verdict
13.2	Immunity		N
13.2.1	Machinesnotincorporatingelectroniccircuits		N
	Machineswithout electronic circuits arenotsensitive to electromagneticemissions undernormal service conditionsand, therefore, no		N
13.2.2	Machinesincorporating electroniccircuits		N
	As electroniccircuitswhicharein machinesgenerally utilize components that are passive (forexamplodiodes, resistors, varistors, capacitors,surge suppressors, inductors), immunity tests are		N
13.3	Emission		N
13.3.1	Machineswithout brushes		N
	Radiated andconducted emissions shall complywith the requirements of CISPR 11, Class B,		N
13.3.2	Machineswith brushes		N
	Radiated andconducted (if applicable)emissionsshallcomplywith the requirements of CISPR 11,		N
13.4	Immunitytests		N
	Immunitytests are not required.		N
13.5	Emission tests		N
	Typetestsshall be carriedoutin accordance with CISPR 11,CISPR 14 andCISPR 16asapplicable.		N
13.5.1	Machineswithout brushes		N
	Machineswithout brushesshallcomplywiththe emission limits of 13.3.1.		N
13.5.2	Machineswith brushes		N
	Machineswith brushes, when tested at no-load, shallcomplywith the emission limits of13.3.2.		N



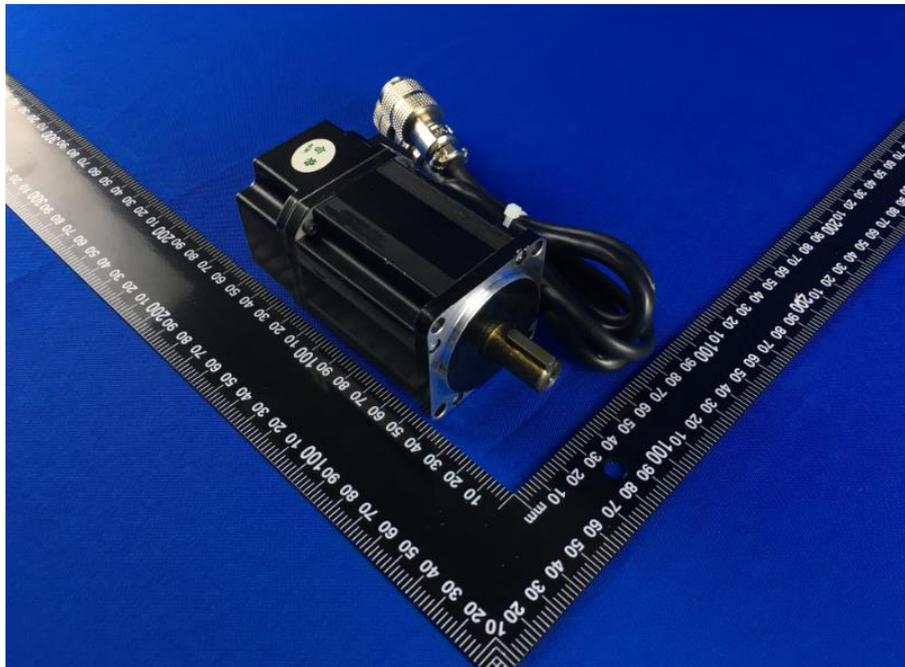
TABLE: listof critical components				
Object/part No.	Manufacturer/ trademark	Type/model	Technical data	Mark(s) of conformity
Slot insulator	Various	PA66	V-0, 130°C	UL
Magnet wire	Various	QAN(AL)-x/130	Class B, 130°C	UL

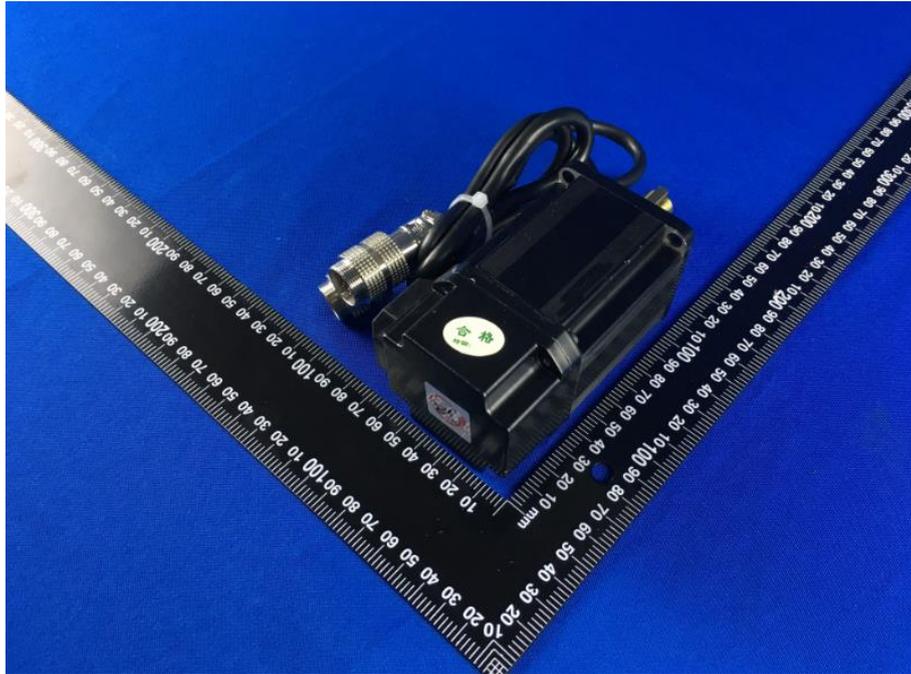
1) An asterisk indicates a mark which assures the agreed level of surveillance

8.6.2	Determination by resistance method				P	
	test voltage (V):		AC 230V	-		
	t1 (°C):		24.4°C	-		
	t2 (°C):		25.2°C	-		
Test condition: output at maximum load for each model.						
Temperature rise T of winding:		R1(Ω) 1.01	R2(Ω) 1.45	dT (K) 73.8	Required dT (K) 80	Insulation class B
Comments: Base on 40°C						

9.2	TABLE: withstand voltage test			P
Test voltage applied between:			Test voltage (V)	Breakdown
Input and core			AC 500V	No

Photographs of the EUT





Remark: Results & photo(s) of this report refer to test report EBO2007103-E159B
(EBO authenticate the photo on original report only)