Test Report issued under the responsibility of:

DEKRA

TEST REPORT
IEC 60034-1
Safety of Rotating electrical machines

Report Reference No. ..... :	3138544.50
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Testing Laboratory ..... :	DEKRA Testing and Certification (Shanghai) Ltd.
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Tested by ..... :	David Yang
Checked by ..... :	Allan Chen
Applicant's name ..... :	LEE YEONG INDUSTRIAL CO., LTD.
Address ..... :	No.2, Kejia Rd., Douliu City, Yunlin County 64057, Taiwan
Test specification:	
Standard ..... :	EN 60034-1: 2010
Non-standard test method..... :	N/A
Test Report Form No. ..... :	EN 60034-1a
Test Report Form(s) Originator..... :	DEKRA Testing and Certification (Shanghai) Ltd.
Master TRF ..... :	2012-12
Test item description ..... :	Multipurpose driving motor
Trade Mark ..... :	AGP
Manufacturer ..... :	LEE YEONG INDUSTRIAL CO., LTD. No.2, Kejia Rd., Douliu City, Yunlin County 64057, Taiwan
Model/Type reference ..... :	VR600
Ratings ..... :	220-240 Vac; 50-60 Hz; 3 A; 330 W; 20 000 /min; Class H; IP20; PF 0,95

Summary of testing:

The tool tested passed all examinations of the applied standards mentioned on page 1 “Test specification” and on page 3 “General remarks”.

Tests performed (name of test and test clause):	**Testing location:**
All appl. clauses of the standard have been done at the TL.	DEKRA Testing and Certification (Shanghai) Ltd. 10F, #250 Jiangchangsan Road, Building 16, Headquarter Economy Park Shibei Hi-Tech Park, Zhabei District, Shanghai, 200436, China

Copy of marking plate:

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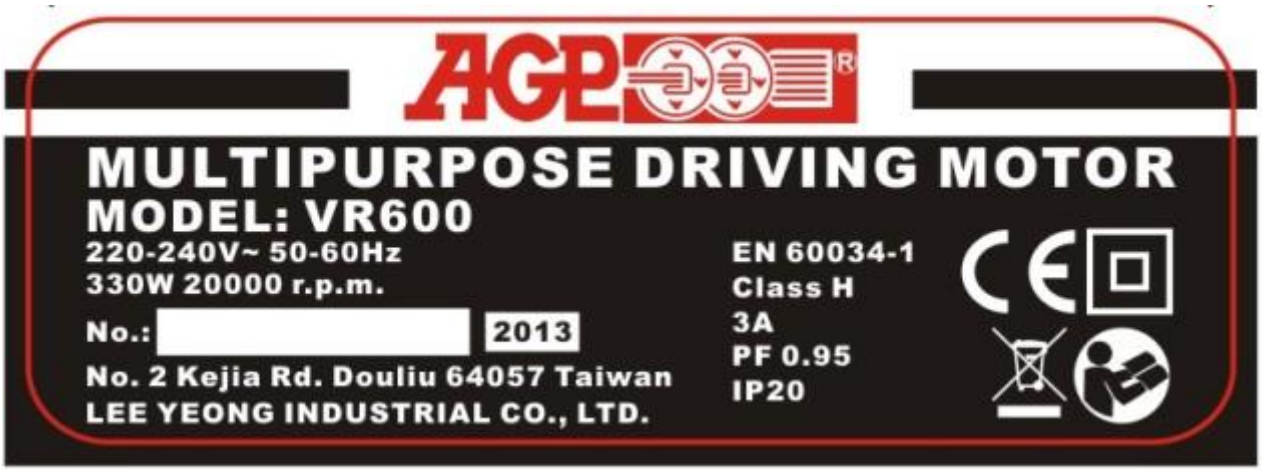

Test item particulars ..... :	
Type of machine ..... :	Motor
Duty Type ..... :	S1
Type of cooling ..... :	Inner cooled winding
Site operating condition	
- Altitude ..... :	Not exceed 1 000 m above sea-level
- Maximum ambient air temperature ..... :	40 °C
- Minimum ambient air temperature ..... :	0 °C
- Water coolant temperature ..... :	-
- Purity of hydrogen coolant ..... :	-
Possible test case verdicts:	
- test case does not apply to the test object ..... :	N/A
- test object does meet the requirement ..... :	P (Pass)
- test object does not meet the requirement ..... :	F (Fail)
Testing ..... :	
Date of receipt of test item ..... :	2013-08-25
Date (s) of performance of tests ..... :	2013-08-26 to 2013-09-27

General remarks:

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.

Throughout this report a comma is used as the decimal separator.

The tools also tested and complies the following standards:

IEC 60034-1:2010

General product information:

This motor is a multipurpose driving motor with a commutator.

Factory Location

LEE YEONG INDUSTRIAL CO., LTD.

No.2, Kejia Rd., Douliu City, Yunlin County 64057, Taiwan

EN 60034-1			
Clause	Requirement + Test	Result - Remark	Verdict

4	**DUTY**		P
4.2	Duty types		P
4.2.1	Duty type S1 – Continuous running duty		P
	Operation at a constant load maintained for sufficient time to allow the machine to reach thermal equilibrium, see Figure 1. The appropriate abbreviation is S1.		P
4.2.2	Duty type S2 – Short-time duty		N/A
	Operation at constant load for a given time, less than that required to reach thermal equilibrium, followed by a time de-energized and at rest of sufficient duration to re-establish machine temperatures within 2 K of the coolant temperature, see Figure 2.		N/A
	The appropriate abbreviation is S2, followed by an indication of the duration of the duty,		N/A
4.2.3	Duty type S3 – Intermittent periodic duty		N/A
	A sequence of identical duty cycles, each including a time of operation at constant load and a time de-energized and at rest, see Figure 3. In this duty, the cycle is such that the starting current does not significantly affect the temperature rise.		N/A
	The appropriate abbreviation is S3, followed by the cyclic duration factor.		N/A
4.2.4	Duty type S4 – Intermittent periodic duty with starting		N/A
	A sequence of identical duty cycles, each cycle including a significant starting time, a time of operation at constant load and a time de-energized and at rest, see Figure 4.		N/A
	The appropriate abbreviation is S4, followed by the cyclic duration factor, the moment of inertia of the motor (JM) and the moment of inertia of the load (Jext), both referred to the motor shaft.		N/A
4.2.5	Duty type S5 – Intermittent periodic duty with electric braking		N/A
	A sequence of identical duty cycles, each cycle consisting of a starting time, a time of operation at constant load, a time of electric braking and a time de-energized and at rest, see Figure 5.		N/A
	The appropriate abbreviation is S5, followed by the cyclic duration factor, the moment of inertia of the motor (JM) and the moment of inertia of the load (Jext), both referred to the motor shaft.		N/A
4.2.6	Duty type S6 – Contimuous operation periodic duty		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	A sequence of identical duty cycles, each cycle consisting of a time of operation at constant load and a time of operation at no-load. There is no time de-energized and at rest, see Figure 6.		N/A
	The appropriate abbreviation is S6, followed by the cyclic duration factor.		N/A
4.2.7	Duty type S7 – Continuous operation periodic duty with electric braking		N/A
	A sequence of identical duty cycles, each cycle consisting of a starting time, a time of operation at constant load and a time of electric braking. There is no time de-energized and at rest, see Figure 7.		N/A
	The appropriate abbreviation is S7, followed by the moment of inertia of the motor (JM) and the moment of inertia of the load (Jext), both referred to the motor shaft.		N/A
4.2.8	Duty type S8 – Continuous operation periodic duty with related load/speed changes		N/A
	A sequence of identical duty cycles, each cycle consisting of a time of operation at constant load corresponding to a predetermined speed of rotation, followed by one or more times of operation at other constant loads corresponding to different speeds of rotation (carried out, for example, by means of a change in the number of poles in the case of induction motors). There is no time de-energized and at rest (see Figure 8).		N/A
	The appropriate abbreviation is S8, followed by the moment of inertia of the motor (JM) and the moment of inertia of the load (Jext), both referred to the motor shaft, together with the load, speed and cyclic duration factor for each speed condition.		N/A
4.2.9	Duty type S9 – Duty with non-periodic load and speed variations		N/A
	A duty in which generally load and speed vary non-periodically within the permissible operating range. This duty includes frequently applied overloads that may greatly exceed the reference load (see Figure 9). The appropriate abbreviation is S9.		N/A
	For this duty type, a constant load appropriately selected and based on duty type S1 is taken as the reference value ("P_{ref}" in Figure 9) for the overload concept.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
4.2.10	Duty type S10 – Duty with discrete constant loads and speeds		N/A
	A duty consisting of a specific number of discrete values of load (or equivalent loading) and if applicable, speed, each load/speed combination being maintained for sufficient time to allow the machine to reach thermal equilibrium, see Figure 10. The minimum load within a duty cycle may have the value zero (no-load or de-energized and at rest).		N/A
	The appropriate abbreviation is S10, followed by the per unit quantities p/Δ t for the respective load and its duration and the per unit quantity TL for the relative thermal life expectancy of the insulation system. The reference value for the thermal life expectancy is the thermal life expectancy at rating for continuous running duty and permissible limits of temperature rise based on duty type S1. For a time de-energized and at rest, the load shall be indicated by the letter r.		N/A
	The value of TL should be rounded off to the nearest multiple of 0,05. Advice concerning the significance of this parameter and the derivation of its value is given in Annex A.		N/A
	For this duty type a constant load appropriately selected and based on duty type S1 shall be taken as the reference value ('P_{ref}' in Figure 10) for the discrete loads.		N/A
5	**RATING**		P
5.1	assignment of rating		P
	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 continuous running duty applies.		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 whole arrangement.		P
	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 covered in IEC 60034-12.		P
5.2	Classes of rating		P
5.2.1	Rating for continuous running duty		P

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	A rating at which the machine may be operated for a limited period, starting at ambient temperature, while complying with the requirements of this standard.		N/A
	This class of rating corresponds to duty type S2 and is designated as for the duty type S2.		N/A
5.2.3	Rating for periodic duty		N/A
	A rating at which the machine may be operated on duty cycles, while complying with the requirements of this standard.		N/A
	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/A
	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: 15 %, 25 %, 40 %, 60 %.		N/A
5.2.4	Rating for non-periodic duty		N/A
	A rating at which the machine may be operated non-periodically while complying with the requirements of this standard.		N/A
	This class of rating corresponds to the non-periodic duty type S9 and is designated as for the duty type S9.		N/A
5.2.5	Rating for duty with discrete constant loads and speeds		N/A
	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.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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 application of this class of rating are given in Annex A.		N/A
	This class of rating corresponds to the duty type S10 and is designated as for the duty type S10.		N/A
5.2.6	Rating for equivalent loading		N/A
	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 the specified duty type.		N/A
	This class of rating, if applied, is designated 'equ'.		N/A
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 type S2, see 4.2.2.		N/A
	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 rating shall be a rating for periodic duty based on a duty type selected from duty types S3 to S8, see 4.2.3 to 4.2.8.		N/A
	When a machine is intended non-periodically to supply variable loads at variable speeds, including overloads, the rating shall be a rating for non-periodic duty based on duty type S9, see 4.2.9.		N/A
	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 rating shall be a rating with discrete constant loads based on duty type S10, see 4.2.10.		N/A
5.4	Allocation of outputs to class of rating		P
	In the determination of the rating:	S1	P

EN 60034-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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/A
5.5	Rated output		P
5.5.1	DC generators		N/A
	The rated output is the output at the terminals and shall be expressed in watts (W).		N/A
5.5.2	AC generators		N/A
	The rated output is the apparent power at the terminals and shall be expressed in volt-amperes (VA) together with the power factor.		N/A
	The rated power factor for synchronous generators shall be 0,8 lagging (over-excited), unless otherwise specified by the purchaser.		N/A
5.5.3	Motors		P
	The rated output is the mechanical power available at the shaft and shall be expressed in watts (W).	330 W	P
5.5.4	Synchronous condensers		N/A
	The rated output is the reactive power at the terminals and shall be expressed in volt-amperes reactive (var) in leading (under-excited) and lagging (over-excited) conditions.		N/A
5.6	Rated voltage		N/A
5.6.1	DC generators		N/A
	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 range, unless otherwise specified, see also 7.3.		N/A
5.6.2	AC generators		N/A
	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 the range, unless otherwise specified, see also 7.3.		N/A
5.7	Co-ordination of voltages and outputs		N/A
	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 1 kV in terms of rated output are as shown in Table 1.		N/A
5.8	Machines with more than one rating		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	For machines with more than one rating, the machine shall comply with this standard in all respects at each rating.		N/A
	For multi-speed motors, a rating shall be assigned for each speed.		N/A
	When a rated quantity (output, voltage, speed, etc.) may assume several values or vary continuously within two limits, the rating 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/A
6	**SITE OPERATING CONDITIONS**		P
6.1	General		P
	Unless other wise specified, machines shall be suitable for the following site operating conditions.		P
6.2	Altitude		P
	The altitude shall not exceed 1000m above sea-level		P
6.3	Maximum ambient air temperature		P
	The ambient air temperature shall not exceed 40℃		P
6.4	Minimum ambient air temperature		P
	The ambient air temperature shall not be less than -15℃ for any machine.		N/A
	The ambient air temperature shall be not less than 0 ℃for a machine with any of the following:		P
	a) rated output greater than 3300 kW (or kVA) per 1000 min^{-1}		N/A
	b) rated output less than 600W (or VA)		P
	c) a commutator		P
	d) a sleeve bearing		N/A
	e) water as a primary or secondary coolant		N/A
6.5	Water coolant temperature		N/A
	For the reference water coolant temperature see Table 4. for other water coolant temperatures see Table 9. the water coolant temperature shall not be less than +5℃		N/A
6.6	Storage and transport		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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 temperature.		N/A
6.7	Purity of hydrogen coolant		N/A
	Hydrogen cooled machines shall be capable of operating at rated output under rated conditions with a coolant containing not less than 95% hydrogen by volume.		N/A
	For calculating efficiency in accordance with IEC 60034-2 (all parts), 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 re-cooled gas, unless other wise agreed. Windage losses shall be calculated at the corresponding density.		N/A
7	**ELECTRICAL OPERATING CONDITIONS**		N/A
7.1	Electrical supply		N/A
	For three-phase a.c. machines, 50Hz or 60Hz, 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/A
	For a.c. motors supplied from static converters these restrictions on voltage, frequency and waveform do not apply. In this case, the rated voltages shall be selected by agreement.		N/A
7.2	Form and symmetry of voltages and currents		N/A
7.2.1	AC motors		N/A
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 exceeding:		N/A
	- 0,02 for single-phase motors and three-phase motors, including synchronous motors but excluding motor of design N (see IEC 60034-12), unless the manufacturer declares otherwise.		N/A
	- 0,03 for design N motors.		N/A
	The HVF shall be computed by using the following formula: $HVF = \sqrt{\sum_{n=2}^{k} \frac{u_n^2}{n}}$		N/A

EN 60034-1			
Clause	Requirement + Test	Result - Remark	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 a long period, or 1,5 % for a short period not exceeding a few minutes, and a zero-sequence component not exceeding 1 % of the positive-sequence component.		N/A
	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 not more than approximately 10 K.		N/A
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.		N/A
7.2.2	AC generators		N/A
	Three-phase a.c. generators shall be suitable for supplying circuits which, when supplied by a system of balanced and sinusoidal voltages:		N/A
	a) result in currents not exceeding a harmonic current factor (HCF) of 0,05, and		N/A
	b) result in a system of currents where neither the negative-sequence component nor the zero-sequence component exceed 5 % of the positive-sequence component.		N/A
	The HCF shall be computed by using the following formula: $HCF = \sqrt{\sum_{n=2}^{k} i_n^2}$		N/A
	Should the limits of deformation and imbalance occur simultaneously in service at the ratedload, 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 be not more than approximately 10 K.		N/A
7.2.3	Synchronous machines		N/A

EN 60034-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Unless otherwise specified, three-phase synchronous machines shall be capable of operating continuously on an unbalanced system in such a way that, with none of the phase currents exceeding the rated current, the ratio of the negative-sequence component of current (I2) to the rated current (IN) does not exceed the values in Table 2 and under fault conditions shall be capable of operation with the product of (I2/IN)2 and time (t) not exceeding the values in Table 2.		N/A
7.2.4	DC motors supplied from static power converters		N/A
	In the case of a d.c. motor supplied from a static power converter, the pulsating voltage and current affect the performance of the machine. Losses and temperature rise will increase and the commutation is more difficult compared with a d.c. motor supplied from a pure d.c. power source.		N/A
	It is necessary, therefore, for motors with a rated output exceeding 5 kW, intended for supply from a static power converter, to be designed for operation from a specified supply, and, if considered necessary by the motor manufacturer, for an external inductance to be provided for reducing the undulation.		N/A
	The static power converter supply shall be characterized by means of an identification code, as follows: $[CCC - U_{aN} - f - L]$		N/A
	Motors with rated output not exceeding 5 kW, instead of being tied to a specific type of static power converter, may be designed for use with any static power converter, with or without external inductance, provided that the rated form factor for which the motor is designed will not be surpassed and that the insulation level of the motor armature circuit is appropriate for the rated alternating voltage at the input terminals of the static power converter.		N/A
	In all cases, the undulation of the static power converter output current is assumed to be so low as to result in a current ripple factor not higher than 0,1 at rated conditions.		N/A
7.3	Voltage and frequency variations during operation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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.		N/A
	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
	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 frequency.		N/A
	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/A
7.4	Three-phase a.c. machines operating on unearthed systems		N/A
	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 unearthed 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 required.		N/A
	If the winding does not have the same insulation at the line and neutral ends, this shall be stated by the manufacturer.		N/A
7.5	Voltage (peak and gradient) withstand levels		P
	For a.c. motors the manufacturer shall declare a limiting value for the peak voltage and for the voltage gradient in continuous operation.		P
	For cage induction motors within the scope of IEC 60034-12, see also IEC 60034-17.		N/A
	For high-voltage a.c. motors, see also IEC 60034-15.		N/A
	For creepage and clearance distances of bare live copper, see IEC 60664-1.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
8	**THERMAL PERFORMANCE AND TESTS**		P
8.1	Thermal class		P
	A thermal class in accordance with IEC 60085 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		P
	The reference coolant for a given method of cooling the machine is specified in Table 4.		P
	If a third coolant is used, temperature rise shall be measured above the temperature of the primary or secondary coolant as specified in Table 4.		N/A
8.3	Conditions for thermal tests		P
8.3.1	Electrical supply		P
	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 component.		P
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 more than 2K.		P
	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 the temperature of the coolant.		N/A
8.3.3	Temperature of coolant		P
	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 windings).		P
8.3.4	Measurement of coolant temperature during test		P

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Clause	Requirement + Test	Result - Remark	Verdict
	The value to be adopted for the temperature of a coolant during a test shall be the mean of the reading 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 variations.		
8.3.4.1	Open machines or closed machines without heat exchangers (cooled by surrounding ambient air or gas)		P
	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 1m to 2m from it. Each detector shall be protected from radiant heat and draughts.		P
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/A
	The temperature of the primary coolant shall be measured where it enters the machine.		N/A
8.3.4.3	Closed machines with machine-mounted or internal heat exchangers		N/A
	The temperature of the primary coolant shall be measured where it enters the machine. The temperature of the secondary coolant shall be measured where it enters the heat exchanger.		N/A
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 shut down at the end of the thermal test, as described in 8.7		P
	When this is not possible, for example, when using the direct measurement of resistance method, see 8.6.2.3		P
	For machines tested on actual periodic duty (duty type S3 to S8) the temperature at the end of the test shall be taken as that at the middle of the rise period causing the greatest heating in the last cycle of operation (but see also 8.7.3)		N/A
8.5	Methods of measurement of temperature		P
8.5.1	General		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Three methods of measuring the temperature of windings and other parts are recognized:		P
	- resistance method	resistance method for the winding	P
	- embedded temperature detector (ETD) method		N/A
	- thermometer method		N/A
	Different methods shall not be used as a check upon one another		N/A
8.5.2	Resistance method		P
	The temperature of the windings is determined from the increase of the resistance of the windings.		P
8.5.3	Embedded temperature detector (ETD) method		P
	The temperature is determined by means of temperature detectors (e.g. resistance thermometers thermocouples or semi-conductor negative coefficient detectors) built into the machine during construction, at points which are inaccessible after the machine is completed.		P
8.5.4	Thermometer method		N/A
	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 preference to mercury thermometers.		N/A
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 5000 kW or more the ETD method shall be used.		N/A
	For a.c. machines having a rated output less than 5000kW but greater than 200kW the manufacturer shall choose either the resistance or the ETD method unless other wise agreed.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	For a.c. machines having a rated output less than or equal to 200kW 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/A
	For machines having a rated output less than or equal to 600W, 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.		P
	The thermometer method is recognized in the following cases:		N/A
	a) when it is not practicable to determine the temperature rise by the resistance method as, for example, with low-resistance commutating coils and compensating windings and, in general, in the case of low-resistance windings, especially when the resistance of joints and connections forms a considerable proportion of the total resistance;		N/A
	b) single layer windings, rotating or stationary		N/A
	c) during routine tests on machines manufactured in large numbers		N/A
	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/A
	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/A
	For windings of armatures having commutators and for field windings, the resistance method and the thermometer method are recognized. The resistance method is preferred, but for stationary field windings of d.c. machines having more than one layer the ETD method may be used.		P
8.6.2	Determination by resistance method		P
8.6.2.1	Measurement		P
	One of the following methods shall be used:		P
	- direct measurement at the beginning and the end of the test, using an instrument having a suitable range		P
	-measurement by d.c. current/voltage in d.c. windings by measuring the current in and the voltage across the winding, using instruments having suitable ranges;		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- measurement by d.c. current/voltage in a.c. windings, by injecting direct current into the winding when de-energized		N/A
8.6.2.2	Calculation		P
	The temperature rise, $\theta_2 - \theta_1$, may be obtained from the equation: $\frac{\theta_2 + k}{\theta_1 + k} = \frac{R_2}{R_1}$	Temperature rise is 36,4K for Stator winding. Temperature rise is 33,1K for Rotor winding.	P
8.6.2.3	Correction for stopping time		P
8.6.2.3.1	General		P
	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 number of people are required.		P
8.6.2.3.2	Short stopping time		P
	If the initial resistance reading is obtained within the time interval specified in Table 5, that reading shall be accepted for the temperature measurement.		P
8.6.2.3.3	Extended stopping time		N/A
	If a resistance reading cannot be made in the time interval specified in Table 5, it shall be made as soon as possible but not after more than twice the interval specified in Table 5, and additional readings shall be taken at intervals of approximately 1min 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 temperatures after shutdown the highest value shall be taken.		N/A
	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/A
8.6.2.3.4	Windings with one coil-side per slot		N/A

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Clause	Requirement + Test	Result - Remark	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 90s to come to rest after switching off the power, the superposition method may be used if previously agreed.		N/A
8.6.3	Determination by ETD method		N/A
8.6.3.1	General		N/A
	The detectors shall be suitably distributed throughout the winding and the number of detectors installed shall be not less than six.		N/A
	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/A
	The highest reading from the ETD elements shall be used to determine the temperature of the winding.		N/A
8.6.3.2	Two or more coil-sides per slot		N/A
	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/A
8.6.3.3	One coil-side per slot		N/A
	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/A
8.6.3.4	End windings		N/A
	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/A
8.6.4	Determination by thermometer method		N/A
	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 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/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The highest reading from any thermometer shall be taken to be the temperature of the winding or other part of the machine.		
8.7	Duration of the 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/A
	The duration of the test shall be the time given in the rating.		N/A
8.7.3	Rating for periodic duty		N/A
	Normally the rating for equivalent loading assigned by the manufacturer shall be applied until thermal equilibrium has been reached. If a test on the actual duty is agreed, the load cycle 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 taken at reasonable intervals over a period of time.		N/A
8.7.4	Ratings for non-periodic duty and for duty with discrete constant loads		N/A
	The rating for equivalent loading assigned by the manufacturer shall be applied until thermal equilibrium has been reached		N/A
8.8	Determination of the thermal equivalent time constant for machines of duty type S9		N/A
	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 the time taken by the machine to cool to one-half of the full load temperature rise, after its disconnection from the supply.		N/A
8.9	Measurement of bearing temperature		P
	Either the thermometer method or the ETD method may be used.		P
	The measuring point shall be as near as possible to one of the two locations specified in Table 6.		P
	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 paste.	Bearing temperature is 36.4℃	P

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Clause	Requirement + Test	Result - Remark	Verdict
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, 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/A
8.10.1	Indirect cooled windings		N/A
	Temperature rises under reference conditions shall not exceed the limits given in Table 7 or Table 8 as appropriate.		N/A
	For other operating site conditions, for ratings other than continuous running duty, and for rated voltages greater than 12000V, the limits shall be adjusted according to Table 9.		N/A
	In the case of thermometer readings made in accordance with 8.6.1, the limit of temperature rise shall be according to Table 7.		N/A
	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 apply at the test site.		N/A
	If the adjusted limits given in Table 11 lead to permissible temperatures at the test site which the manufacturer considers to be excessive, the test procedure and the limits shall be agreed.		N/A
	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/A
8.10.2	Direct cooled windings		P
	Temperatures under reference conditions shall not exceed the limits given in Table 12		P
	For other operating site conditions the limits shall be adjusted according to Table 13		N/A
	If conditions at the test site differ from those at the operating site, the adjusted limits given in Table 14 shall apply at the test site.		N/A

EN 60034-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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/A
8.10.3	Adjustments to take account of hydrogen purity on test		N/A
	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/A
8.10.4	Permanently short-circuited windings, magnetic cores and all structural components whether or not in contact with insulation		P
	The temperature rise or the temperature shall not be detrimental to the insulation of that part or to any other part adjacent to it.		P
8.10.5	Commutators and sliprings, open or enclosed and their brushes and brushgear		P
	The temperature rise or temperature of any commutator, slipring, brush or brushgear shall not be detrimental to the insulation of that part or any adjacent part.		P
	The temperature rise or temperature of a commutator or slipring shall not exceed that at which the combination of brush grade and commutator or slipring material can handle the current over the full operating range.		P
9	**OTHER PERFORMANCE AND TESTS**		P
9.1	Routine tests		P
	Routine tests are always factory tests. They can only be performed on machines which are assembled at the works of the manufacturer. The machine need not be completely assembled. It can lack components which are not significant for the testing. Routine tests do not need the machine to be coupled except for the open-circuit test on synchronous machines.		P
	The minimum test schedule is listed in Table 15 and is applicable for machines with rated output less than or equal to 20MW. Additional routine tests may be performed especially on machines with ratings above 200kW. The term synchronous machines includes permanent magnet machines.		P
	For d.c. machines, depending on size and design, a commutation test under load may be performed as a routine test.		N/A
9.2	Withstand voltage test		P

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Clause	Requirement + Test	Result - Remark	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 immediately after that test.		P
	In the case of polyphase machines with rated voltage above 1kV having both ends of each phase individually accessible, the test voltage shall be applied between each phase and the frame, with the core and the other phases and windings not under test connected to the frame.		N/A
	Except as stated below, the test voltage shall be of power frequency and as near as possible to a sine wave form. The final value of the voltage 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	1500V/1min subjected between the L/N and metal enclosure	P
	The test shall be commenced at a voltage not exceeding half of the full test voltage. The voltage 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 10s. 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 during this period.		P
	During the routing testing of quantity produced machines up to 200kW and rated for U_N less than or equal to 1kV,the 1min test may be replaced by a test of 1s at 120% of test voltage specified in Table 16.		N/A
	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 voltage specified in Table 16.		N/A
	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/A
	Completely rewound windings shall be tested at the full test voltage for new machines.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	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 procedure is recommended:		N/A
	a) partially rewound windings are tested at 75% of the test voltage for a new machine. Before the test, the old part of the winding shall be carefully cleaned and dried;		N/A
	b) overhauled machines, after cleaning and drying, are subjected to a test at a voltage equal to 1,5 times the rated voltage, with a minimum of 1000V if the rated voltage is equal to or greater than 100V and a minimum of 500V if the rated voltage is less than 100V.		N/A
9.3	Occasional excess current		P
9.3.1	General		P
	The excess current capability of rotating machines is given for the purpose of co-ordinating these machine with control and protective devices. 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 capability should be the subject of agreement.		P
9.3.2	Generators		N/A
	AC generators having rated outputs not exceeding 1200 MW shall be capable of withstanding a current equal to 1,5 times the rated current for not less than 30 s.		N/A
	AC generators having rated outputs above 1200MW 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 less than 15 s.		N/A
9.3.3	Motors (except commutator motors and permanent magnet motors)		N/A
	Polyphase motors having rated outputs not exceeding 315kW and rated voltages not exceeding 1 kV shall be capable of withstanding:		N/A
	- a current equal to 1,5 times the rated current for not less than 2 min.		N/A
9.3.4	Commutator machines		P

EN 60034-1			
Clause	Requirement + Test	Result - Remark	Verdict
	A commutator machine shall be capable of withstanding, for 60 s, 1,5 times rated current under the appropriate combination of conditions as follows:	4,5 A; 60 s	P
	a) speed: 1) d.c. motor: highest full-field speed; 2) d.c. generator: rated speed; 3) a.c. commutator motor: highest full-field speed	highest full-field speed	P
	b) armature voltage: that corresponding to the specified speed		P
9.4	Momentary excess torque for motors		P
9.4.1	Polyphase induction motors and d.c. motors		N/A
	Motors, whatever their duty and construction, shall be capable of withstanding and excess torque of at least 60% of their rated torque for 15 s without either stalling or exhibiting an abrupt change of speed. The voltage and frequency shall be maintained at their rated values.		N/A
	For d.c. motors, the torque shall be expressed in terms of overload current.		N/A
	Motors for duty type S9 shall be capable of withstanding momentarily an excess torque determined according to the duty specified.		N/A
	Motors intended for specific applications that require a high torque shall be the subject of agreement.		N/A
	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 than 50%.		N/A
	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/A
9.4.2	Polyphase synchronous motors		N/A
	Unless otherwise agreed, a polyphase synchronous motor, irrespective of the duty, shall be capable of withstanding an excess torque as specified below for 15 s with out 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 equipment operating under normal conditions:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- synchronous (wound rotor) induction motors: 35% excess torque		N/A
	- synchronous (cylindrical rotor) motors: 35% excess torque		N/A
	-synchronous (salient pole) motors: 50% excess torque		N/A
9.4.3	Other motors		P
	The momentary excess torque for single-phase, commutator and other motors shall be the subject of agreement.		P
9.5	Pull-up torque		N/A
	Unless otherwise specified, the pull-up torque of cage induction motors under full voltage shall be not less than 0,3 times the rated torque.		N/A
9.6	Safe operating speed of cage induction motors		N/A
	All three-phase single-speed cage induction motors of frame number up to and including 315 and for voltages up to and including 1000V 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/A
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. 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 with the required dielectric tests. The duration of any overspeed test shall be 2 min.	24 000 /min for 2 min.	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 normal operation.		P
	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 that the balance is satisfactory up to that speed.		N/A
9.8	Short-circuit current for synchronous machines		N/A

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Clause	Requirement + Test	Result - Remark	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 times the r.m.s. value of the rated current.		N/A
	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.		N/A
9.9	Short-circuit withstand test for synchronous machines		N/A
	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 rated voltage at no load.		N/A
	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/A
	The test is considered satisfactory if no harmful deformation occurs and if the requirements of the applied voltage dielectric test are met after the short-circuit test. For three-phase turbine-type machines.		N/A
9.10	Commutation test for commutator machines		P
	A d.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 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 performed in warm conditions.		P
9.11	Total harmonic distortion for synchronous machines		N/A
9.11.1	General		N/A
	The requirements of this subclause apply only to synchronous machines having rated outputs of 300kW or more, intended for connection to power networks operating at nominal frequencies of 16 2/3 Hz to 100Hz inclusive, with a view to minimizing interference caused by the machines.		N/A
9.11.2	Limits		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	When tested on open-circuit and at rated speed and voltage, the total harmonic distortion of the line-to-line terminal voltage, as measured according to the methods laid down in 9.11.3, shall not exceed 5%.		N/A
9.11.3	Tests		N/A
	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 from rated frequency up to the 100th harmonic.		N/A
	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: $THD = \sqrt{\sum_{n=2}^{k} u_n^2}$		N/A
10	**RAING PLATES**		P
10.1	General		P
	Every electrical machine shall be provided with a rating plate. The plates shall be made of durable material and be securely mounted. The writing has to be made with durable print.		P
	The rating plate 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 so enclosed or incorporated in the equipment that its rating plate is not easily legible, the manufacturer shall, on request, supply a second plate to be mounted on the equipment.		P
10.2	Marking		P
	Machines with rated outputs up to and including 750 W (or VA) and dimensions not covered by IEC 60072 shall be marked with the information given in items a, b, k, l and z below as a minimum. For special-purpose and built-in machines with rated outputs up to and including 3 kW (or kVA) items a, b, k and l shall be marked as a minimum and item z may be provided in another form.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	In all other cases, rating plate(s) shall be durably marked with the items in the following list, as far as they apply. 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 combined.		P
	a) The manufacturer's name or mark.	LEE YEONG INDUSTRIAL CO., LTD.	P
	b) The manufacturer's serial number, or identification mark.	See marking label.	P
	c) Information to identify the year of manufacture. This shall be marked on the rating plate or be given on a separate data sheet to be provided with the machine.	2013	P
	d) The manufacturer's machine code.	VR600	P
	e) For a.c. machines, the number of phases.	single-phase	P
	f) The number(s) of the rating and performance standard(s) which are applicable (IEC 60034-X and/or equivalent national standard(s)). If IEC 60034 is marked, this implies compliance with all the other relevant standards of the IEC 60034 series.	EN60034-1	P
	g) The degree of protection provided by the integral design of the rotating electrical machine (IP code) in accordance with IEC 60034-5.	IP20	P
	h) For motors within the scope of IEC 60034-30, the efficiency class (IE code) and the rated efficiency as specified in IEC 60034-30.		N/A
	i) The thermal class and the limit of temperature or of temperature rise (when lower than that of the thermal class) and, if necessary, the method of measurement, followed in the case of a machine with a water-cooled heat exchanger by 'P' or 'S', depending on whether the temperature rise is measured above the primary or secondary coolant respectively (see 8.2). This information shall be given for both stator and rotor (separated by a slash) when their thermal class differ.	Class H	P
	j) The class(es) of rating of the machine if designed for other than rating for continuous running duty S1, see 5.2.		N/A
	k) The rated output(s) or range of rated output.	330W	P

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Clause	Requirement + Test	Result - Remark	Verdict
	l) The rated voltage(s) or range of rated voltage.	220-240V	P
	m) For a.c. machines the rated frequency or range of rated frequency. For universal motors, the rated frequency shall be followed by the appropriate symbol	50-60Hz	P
	n) For synchronous machines excited by permanent magnets the open circuit voltage at rated speed.		N/A
	o) The rated current(s) or range of rated current.	3A	P
	p) The rated speed(s) or range of rated speed.	20000 r.p.m	P
	q) The permissible overspeed if other than specified in 9.7. or the maximum safe operating speed if less than in 9.6 or if the machine is designed especially for variable speed operation.		N/A
	r) For d.c. machines with separate excitation or with shunt excitation and for synchronous machines, the rated field voltage and the rated field current.		N/A
	s) For a.c. machines, the rated power factor(s).	PF 0.95	P
	t) For wound-rotor induction machines, the rated open-circuit voltage between slip-rings and the rated slip-ring current.		N/A
	u) For d.c. motors with armatures intended to be supplied by static power converters, the identification code of the static power converter in accordance with IEC 60971. Alternatively, for motors not exceeding 5 kW, the rated form factor and the rated alternating voltage at the input terminals of the static power converter, when this exceeds the rated direct voltage of the motor armature circuit.		N/A
	v) The maximum ambient air temperature, if other than 40 °C. The maximum water coolant temperature, if other than 25 °C.		N/A
	w) The minimum ambient air temperature if other than specified in 6.4.		N/A
	x) The altitude for which the machine is designed (if exceeding 1 000 m above sea-level).		N/A
	y) For hydrogen-cooled machines, the hydrogen pressure at rated output.		N/A
	z) When specified, the approximate total mass of the machine, if exceeding 30 kg.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	aa) For machines suitable for operation in only one direction of rotation, the direction of rotation, indicated by an arrow. This arrow need not be on the rating plate, but it shall be easily visible.		N/A
	bb) The connecting instructions in accordance with IEC 60034-8 by means of a diagram or text located near the terminals.	A supply cord with a plug has been provided with the motor. Only one kind of connection.	N/A
	Two different rated values shall be indicated by X/Y and a range of rated values shall be indicated by X–Y (see IEC 61293).		N/A
	Except for normal maintenance, when a machine is repaired or refurbished an additional plate shall be provided to indicate the name of the company undertaking the work, the year of repair and the changes made.		N/A
11	**MISCELLANEOUS REQUIREMENTS**		N/A
11.1	Protective earthing of machines		N/A
	Machines shall be provided with an earthing terminal or another device to permit the connection of a protective conductor or an earthing conductor.	The motor is class II motor with reinforced insulation.	N/A
	The symbol  or legend shall identify this device. However, machines shall neither be earthed nor be provided with an earthing terminal when:		N/A
	a) they are fitted with supplementary insulation, or;	The motor is class II motor with reinforced insulation.	P
	b) they are intended for assembly in apparatus having supplementary insulation, or;		N/A
	c) they have rated voltages up to 50 V a.c. or 120 V d.c. and are intended for use on SELV circuits.		N/A
	In the case of machines having rated voltages greater than 50 V a.c. or 120 V d.c., but not exceeding 1 000 V a.c. or 1 500 V d.c., the terminal for the earthing conductor shall be situated in the vicinity of the terminals for the line conductors, being placed in the terminal box, if one is provided. Machines having rated outputs in excess of 100 kW (or kVA) shall have in addition an earthing terminal fitted on the frame.		N/A
	Machines for rated voltages greater than 1 000 V a.c. or 1 500 V d.c. shall have an earthing terminal on the frame, for example an iron strap, and in addition, a means inside the terminal box for connecting a conducting cable sheath, if any.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The earthing terminal shall be designed to ensure a good connection with the earthing conductor without any damage to the conductor or terminal. Accessible conducting parts which are not part of the operating circuit shall have good electrical contact with each other and with the earthing terminal. When all bearings and the rotor winding of a machine are insulated, the shaft shall be electrically connected to the earthing terminal, unless the manufacturer and the purchaser agree to alternative means of protection.		N/A
	When an earthing terminal is provided in the terminal box, it shall be assumed that the earthing conductor is made of the same metal as the lead conductors.		N/A
	When an earthing terminal is provided on the frame, the earthing conductor may, by agreement, be made of another metal (for example, steel). In this case, in designing the terminal, proper consideration shall be given to the conductivity of the conductor.		N/A
	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 other sizes listed.		N/A
	For other cross-sectional areas of phase conductors, the earthing or protective conductor shall have a cross-sectional area at least equivalent to:		N/A
	– that of the phase conductor for cross-sectional areas less than 25 mm2;		N/A
	– 25 mm2 for cross-sectional areas between 25 mm2 and 50 mm2;		N/A
	– 50 % of that of the phase conductor for cross-sectional areas exceeding 50 mm2.		N/A
	The earthing terminal shall be identified in accordance with IEC 60445.		N/A
11.2	Shaft-end key(s)		
	When a machine shaft end is provided with one or more keyways, each shall be provided with a full key of normal shape and length.		N/A

12	**TOLERANCES**	N/A
12.1	General	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Tolerance is the maximum allowed deviation between the test result of a quantity from Table 20 and the declared value on the rating plate or in the catalogue. As long as test procedures and test equipment according to IEC standards are used, the test result shall not exceed the allowed deviation independent of test laboratory or equipment. Tolerance does not cover the uncertainty of a test procedure, i.e. the deviation between the test result and the true value.	No rated tolerance.	N/A
12.2	Tolerances on values of quantities		N/A
	Unless stated otherwise, tolerances on declared values shall be as specified in Table 20.		N/A
13	**ELECTROMAGNETIC COMPATIBILITY (EMC)**		P
13.1	General		P
	The following requirements apply to rotating electrical machines with rated voltages not exceeding 1 000 V a.c. or 1 500 V d.c. and which are intended for operation in industrial environments.	Refer to the report 3139256.50	P
	Electronic components mounted inside a rotating electrical machine and which are essential for its operation (for example rotating excitation devices) are part of the machine.		N/A
	Requirements which apply to the final drive system and its components, for example power and control electronic equipment, coupled machines, monitoring devices, etc. whether mounted inside or outside the machine, are outside the scope of this standard.		N/A
	The requirements of this clause apply to machines that are supplied directly to the end-user.		P
	Transients (such as starting) are not covered by this clause.		P
13.2	Immunity		P
13.2.1	Machines not incorporating electronic circuits		P
	Machines without electronic circuits are not sensitive to electromagnetic emissions under normal service conditions and, therefore, no immunity tests are required.		P
13.2.2	Machines incorporating electronic circuits		N/A
	As electronic circuits which are incorporated in machines generally utilize components that are passive (for example diodes, resistors, varistors, capacitors, surge suppressors, inductors), immunity tests are not required.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	WARNING: Class A equipment is intended for use in an industrial environment. In the documentation for the user, a statement shall be included drawing attention to the fact that there may be potential difficulties in ensuring electromagnetic compatibility in other environments, due to conducted as well as radiated disturbances.		N/A
13.3	Emission		P
13.3.1	Machines without brushed		N/A
	Radiated and conducted emissions shall comply with the requirements of CISPR 11, Class B, Group 1, see Table B.1.		N/A
13.3.2	Machines with brushed		P
	Radiated and conducted (if applicable) emissions shall comply with the requirements of CISPR 11, Class A, Group 1, see Table B.2.	Refer to the report 3139256.50	P
13.4	Immunity tests		P
	Immunity tests are not required.		P
13.5	Emission tests		P
	Type tests shall be carried out in accordance with CISPR 11, CISPR 14 and CISPR 16 as applicable.	Refer to the report 3139256.50	P
13.5.1	Machines without brushes		N/A
	Machines without brushes shall comply with the emission limits of 13.3.1.		N/A
13.5.2	Machines with brushes		P
	Machines with brushes, when tested at no-load, shall comply with the emission limits of 13.3.2.		P
14	**SAFETY**		P
	Rotating machines in accordance with this standard shall comply with the requirements of IEC 60204-1 or IEC 60204-11 or, in the case of rotating machines incorporated in household and similar electrical appliances, IEC 60335-1, as appropriate unless otherwise specified in this standard, and be designed and constructed as far as possible in accordance with internationally accepted best design practice, appropriate to the application.		P

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Clause	Requirement + Test	Result - Remark	Verdict
ANNEX A	**GUIDANCE FOR THE APPLICATION OF DUTY TYPE S10 AND FOR ESTABLISHING THE VALUE OF RELATIVE THERMAL LIFE EXPECTANCY TL**		N/A
A.1	The load of the machine at any moment is equivalent to duty type S1 corresponding to 4.2.1. However, the load cycle may comprise loads other than the rated load based on duty type S1. A load cycle comprising four discrete constant load/speed combinations is shown in Figure 10.		N/A
A.2	Depending on the value and duration of the different loads within one cycle, the relative life expectancy of the machine based on the thermal ageing of the insulation system can be calculated by the following equation: $\frac{1}{TL} = \sum_{i=1}^{n} \Delta t_i \times 2^{\frac{\Delta\Theta_i}{k}}$		N/A
A.3	The quantity TL is an integral part of the unambiguous identification of the class of rating.		N/A
A.4	The value of the quantity TL can be determined only when, in addition to information concerning the load cycle according to Figure 10, the value k for the insulation system is known. This value k has to be determined by experiments in conformity with IEC 60034-18 for the whole temperature range within which the load cycle takes place according to Figure 10.		N/A
A.5	TL can be stated sensibly as a relative value only. This value can be used by approximation to assess the real change in the machine thermal life expectancy as compared to duty type S1 with rated output, because it may be assumed that in consideration of the varying loads existing within a cycle the remaining influences over the lifetime of the machine (e.g. dielectric stress, environmental influences) are approximately the same as in the case of duty type S1 with rated output.		N/A
A.6	The manufacturer of the machine is responsible for the correct compilation of the various parameters for determining the value of TL.		N/A

ANNEX B	**ELECTROMAGNETIC COMPATIBILITY (EMC) LIMITS**		P
	Limits according to Table B.1 and Table B.2		P

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Clause	Requirement + Test	Result - Remark	Verdict

ANNEX ZZ	**COVERAGE OF ESSENTIAL REQUIREMENTS OF EC DIRECTIVES**		P
	This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and within its scope the standard covers all relevant essential requirements as given in Annex I of the EC Directive 2004/108/EC. Compliance with this standard provides one means of conformity with the specified essential requirements of the Directive concerned. WARNING: Other requirements and other EC Directives may be applicable to the products falling within the scope of this standard.		P

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Clause	Requirement + Test	Result - Remark	Verdict

8.10	TABLE: Temperature Rise Measurements		P
Test voltage .....:		220	—
Ambient temperature (°C) .....:		19,7	—
Operating time .....:		68 min	—
No Load Speed.....:		18864 /min	—
Input current (A) / Input Wattage (W).....:		2.916 A/617 W	—
Torque (Nmm).....:		230	—

Measurement at:	Temperature rise in (K)	Allowed Limit (K)
Ambient of switch	2	30
Power cord	3	50
Internal wire near motor	16	50
Handle	3	50
Switch knob	4	50
Brush holder	12	65
Motor core	21	Refrence
Enclosure (Plastic)	10	60
X2 capacitor	3	50
Supplementary Information: The limit is just a reference.		

8.10	TABLE: Temperature Rise of Windings				P
Part under test (windings and core laminations)	R_1 (Ω)	R_2 (Ω)	dT (K) by resistance	Allowed dT (K)	Insulation Class
Stator 1	3.261	3.743	36.4	140	H
Stator 2	3.247	3.714	35.4	140	H
Rotor (1- 12th bars)	5.743	6.517	33.1	140	H
Supplementary Information: -					

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Photos:

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Clause	Requirement + Test	Result - Remark	Verdict

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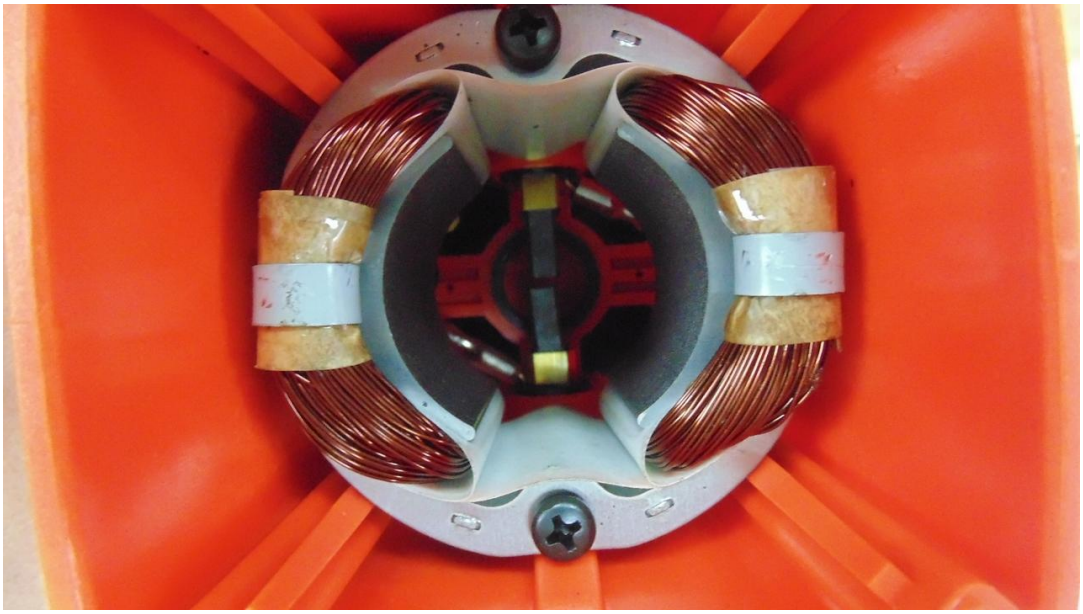
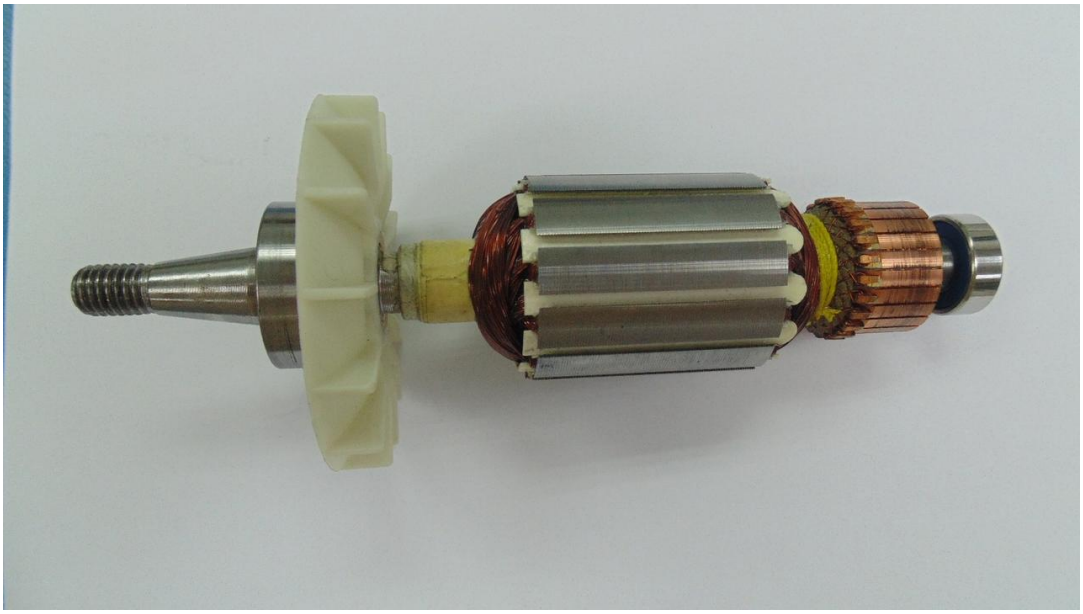
Clause	Requirement + Test	Result - Remark	Verdict





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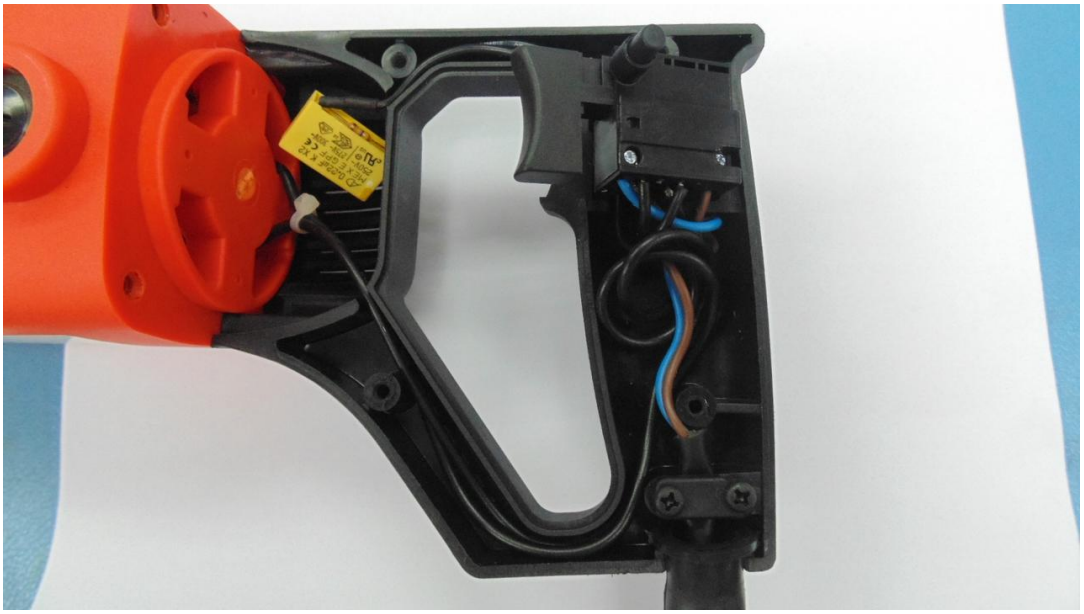
Clause	Requirement + Test	Result - Remark	Verdict



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