



| TEST REPORT EN 60034-1:2010 Rotating electrical machines -Part 1: Rating and performance | |
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| Manufacture's name | Zhejiang Shengyuan Compressor Manufacturing Co.,Ltd. |
| Address | Danya Industrial Park,Zeguo,Wenling City,Zhejiang,China |
| Testing Laboratory Name | SGS-CSTC Standards Technical Services Co., Ltd. Ningbo Branch |
| Address | No.1177, Lingyun Road, Hi-Tech Zone, Ningbo, Zhejiang, China |
| Test specification: | |
| Standard | EN 60034-1:2010 |
| Test procedure | SGS-CSTC |
| Non-standard test method | N/A |
| Test Report Form No. | IEC 60034-1_A |
| TRF originator | SGS-CSTC |
| Master TRF | 2013-06 |
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| Test item description | Three-phase AC asynchronous motor |
| Trade Mark | -- |
| Model Code | -- |
| Model/Type reference | See page 3 ~ 4 in this report |
| Ratings | See Copy of marking plate |



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Summary of testing

All tests and assessments are performed on the prototype of the original sampled machine (Y2-90L-2-1.5kW-B3, Y2-90L-2-2.2kW-B3, Y2-100-2-3kW-B3, Y2-132S1-2-5.5kW-B3, Y2-132S2-2-7.5kW-B3, Y2-132S2-4-7.5kW-B3) and the technical file which are submitted by the client.

Considering the results of the performed test according to standard EN 60034-1:2010, the items under test are IN COMPLIANCE with the requested specifications specified in the standard.

Tests performed (name of test and test clause):

Full test of EN 60034-1:2010

Testing location:

No.1177, Lingyun Road, Hi-Tech Zone, Ningbo, Zhejiang, China

SGS-CSTC Standards Technical Services Co., Ltd. Ningbo Branch

Copy of marking plate:

Content of other models are same, except for model name.

VEVOR
TOUGH TOOLS, HALF PRICE
Technical Support and E-Warranty
Certificate www.vevor.com/support

TYPE: Y2-90L-2-2.2kW-B3 **Three-phase:** 400V
OUTPUT: 2.2 kW **Hz:** 50
AMP'S: 4.7A **SPEED:** 2890r/min **INS.:** F
IP: 55 **S.F:** 1.1 **Cos:** 0.95 **EEFI:** 78%
Weight: 15.2Kg

U₁ V₁ W₁
 O — O — O
 O O O
 W₂ U₂ V₂

Zhejiang Shengyuan Compressor Manufacturing Co.,Ltd.
 Danya Industrial Park,Zeguo,Wenling City,Zhejiang,Chi

SN: **EN 60034-1** **CE** **MADE IN CHINA**



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Testing case verdicts

Test case does not apply to the test object.....: N/A
 Test item does meet the requirement.....: P(ass)
 Test item does not meet the requirement.....: F(ail)

Testing

Date of receipt of test item.....: 2024-02-28
 Date(s) of performance of test.....: 2024-02-28 to 2024-03-05

General remarks

The test results presented in this report relate only to the object tested.
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 Content:
 Main test report --- EN 60034-1:2010
 Annex 1---Temperature Data
 Annex 2---Photo Documents

General product information:

This is Three-phase AC asynchronous motor

| Model | Rated Voltage (V) | Rated Frequency (Hz) | Rated Current (A) | Rated Power (kW) | Speed. (r/min) | I.C. | IP |
|-------------------|-------------------|----------------------|-------------------|------------------|----------------|------|----|
| Y2-90L-2-1.5kW-B3 | 230/400 | 50 | 9.5/3.5 | 1.5 | 3000 | F | 55 |
| Y2-90L-2-2.2kW-B3 | 400 | 50 | 4.70 | 2.2 | 2890 | F | 55 |



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| | | | | | | | |
|---------------------|-----|----|-------|-----|------|---|----|
| Y2-100-2-3kW-B3 | 400 | 50 | 6.39 | 3 | 2890 | F | 55 |
| Y2-112-2-4kW-B3 | 400 | 50 | 8.50 | 4 | 2890 | F | 55 |
| Y2-132S1-2-5.5kW-B3 | 400 | 50 | 10.70 | 5.5 | 2890 | F | 55 |
| Y2-132S2-2-7.5kW-B3 | 400 | 50 | 14.36 | 7.5 | 2890 | F | 55 |
| Y2-132S2-4-7.5kW-B3 | 400 | 50 | 14.15 | 7.5 | 1400 | F | 55 |

| EN 60034-1 | | | |
|--------------|--|-------------------------|---------|
| Clause | Requirement Test | Result – Value – Remark | Verdict |
| 4 | Duty | | - |
| 4.1 | <p>Declaration of duty</p> <p>It is the responsibility of the purchaser to declare the duty. The purchaser may describe the duty by one of the following:</p> <ul style="list-style-type: none"> a) numerically, where the load does not vary or where it varies in a known manner; b) as a time sequence graph of the variable quantities; c) by selecting one of the duty types S1 to S10 that is no less onerous than the expected duty. <p>The duty type shall be designated by the appropriate abbreviation, specified in 4.2, written after the value of the load.</p> <p>An expression for the cyclic duration factor is given in the relevant duty type figure.</p> <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. These values are provided by the manufacturer.</p> <p>Where the purchaser does not declare a duty, the manufacturer shall assume that duty type S1 (continuous running duty) applies.</p> | S1 | P |
| 4.2 | Duty types | | - |
| 4.2.1 | <p>Duty type S1 - Continuous running duty</p> <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> | Duty type S1 | P |
| 4.2.2 | <p>Duty type S2 - Short-time duty</p> <p>Operation at constant load for a given time, less than that required to reach thermal equilibrium, followed by a time at rest and de-energized, of sufficient duration to re-establish machine temperatures within 2K of the coolant temperature, see Figure 2. The appropriate abbreviation is S2, followed by an indication of the duration of the duty.</p> | | N/A |
| 4.2.3 | <p>Duty type S3 - Intermittent periodic duty</p> <p>A sequence of identical duty cycles, each including a time of operation at constant load and a time at rest and de-energized, see Figure 3. In this duty, the cycle is such that the starting current does not significantly affect the temperature rise. The appropriate abbreviation is S3, followed by the cyclic duration factor.</p> | | N/A |

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|------------|---|-------------------------|---------|
| Clause | Requirement Test | Result – Value – Remark | Verdict |
| 4.2.4 | <p>Duty type S4 - Intermittent periodic duty with starting</p> <p>A sequence of identical duty cycles, each cycle including a significant starting time, a time of operation at constant load and a time at rest and de-energized, see Figure 4.</p> <p>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.</p> | | N/A |
| 4.2.5 | <p>Duty type S5 - Intermittent periodic duty with electric braking</p> <p>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 at rest and de - energized, see Figure 5. 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.</p> | | N/A |
| 4.2.6 | <p>Duty type S6 - Continuous-operation periodic duty</p> <p>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 at rest and de-energized, see Figure 6. The appropriate abbreviation is S6, followed by the cyclic duration factor.</p> | | N/A |
| 4.2.7 | <p>Duty type S7 - Continuous-operation periodic duty with electric braking</p> <p>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 at rest and de-energized, see Figure 7. 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.</p> | | N/A |

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|------------|---|-------------------------|---------|
| Clause | Requirement Test | Result – Value – Remark | Verdict |
| 4.2.8 | <p>Duty type S8 - Continuous-operation periodic duty with related load/speed changes</p> <p>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).</p> <p>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.</p> | | N/A |
| 4.2.9 | <p>Duty type S9 - Duty with non-periodic load and speed variations</p> <p>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).</p> <p>The appropriate abbreviation is S9.</p> <p>For this duty type a constant load appropriately selected and based on duty type S1 is taken as the reference value ("Pref" in Figure 9) for the overload concept.</p> | | N/A |
| 4.2.10 | <p>Duty type S10 - Duty with discrete constant loads and speeds</p> <p>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).</p> | | N/A |
| | <p>The appropriate abbreviation is S10, followed by the per unit quantities $p/\Delta t$ 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 at rest and de-energized, the load shall be indicated by the letter r.</p> | | N/A |

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| Clause | Requirement Test | Result – Value – Remark | Verdict |
| | <p>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.</p> <p>For this duty type a constant load appropriately selected and based on duty type S1 shall be taken as the reference value (“Pref” in Figure 10) for the discrete loads.</p> <p>NOTE The discrete values of load will usually be equivalent loading based on integration over a period of time. It is not necessary that each load cycle be exactly the same, only that each load within a cycle be maintained for sufficient time for thermal equilibrium to be reached, and that each load cycle be capable of being integrated to give the same relative thermal life expectancy.</p> | | N/A |
| 5 | Rating | | - |
| 5.1 | <p>Assignment of rating</p> <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 4.2.1 to 4.2.6. 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> <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> <p>NOTE This does not apply to power transformers connected between the machine and the supply.</p> <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> | | P |
| 5.2 | Classes of rating | | - |
| 5.2.1 | <p>Rating for continuous running duty</p> <p>A rating at which the machine may be operated for an unlimited period, while complying with the requirements of this standard. This class of rating corresponds to duty type S1 and is designated as for the duty type S1.</p> | Duty type: S1. | P |

| EN 60034-1 | | | |
|------------|--|-------------------------|---------|
| Clause | Requirement Test | Result – Value – Remark | Verdict |
| 5.2.2 | <p>Rating for short-time duty</p> <p>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. This class of rating corresponds to duty type S2 and is designated as for the duty type S2.</p> | | N/A |
| 5.2.3 | <p>Rating for periodic duty</p> <p>A rating at which the machine may be operated on duty cycles, while complying with the requirements of this standard. This class of rating corresponds to one of the periodic duty types S3 to S8 and is designated as for the corresponding duty type.</p> <p>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 %.</p> | | N/A |
| 5.2.4 | <p>Rating for non-periodic duty</p> <p>A rating at which the machine may be operated non-periodically while complying with the requirements of this standard. This class of rating corresponds to the non-periodic duty type S9 and is designated as for the duty type S9.</p> | | N/A |
| 5.2.5 | <p>Rating for duty with discrete constant loads</p> <p>A rating at which the machine may be operated with the associated loads 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, e.g. 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.</p> <p>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. This class of rating corresponds to the duty type S10 and is designated as for the duty type S10.</p> <p>NOTE Other relevant IEC standards may specify the maximum load in terms of limiting winding temperature (or temperature rise) instead of per unit load based on duty type S1</p> | | N/A |

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|------------|--|-------------------------|---------|
| Clause | Requirement Test | Result – Value – Remark | Verdict |
| 5.2.6 | <p>Rating for equivalent loading</p> <p>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.</p> <p>NOTE The determination of an equivalent rating should take account of the varying load, speed and cooling of the duty cycle.</p> <p>This class of rating, if applied, is designated "equ".</p> | | N/A |
| 5.3 | <p>Selection of a class of rating</p> <p>A machine manufactured for general purpose shall have a rating for continuous running duty and be capable of performing duty type S1.</p> <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> <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.</p> <p>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.</p> <p>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.</p> <p>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.</p> | Duty type: S1 | P |
| 5.4 | <p>Allocation of outputs to class of rating</p> <p>In the determination of the rating. 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. 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.</p> | | P |
| 5.5 | Rated output | | - |
| 5.5.1 | <p>DC generators</p> <p>The rated output is the output at the terminals and shall be expressed in watts (W).</p> | | N/A |

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|--------------|---|-------------------------|---------|
| Clause | Requirement Test | Result – Value – Remark | Verdict |
| 5.5.2 | AC generators The rated output is the apparent power at the terminals and shall be expressed in volt-amperes (VA) together with the power factor. 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 The rated output is the mechanical power available at the shaft and shall be expressed in watts(W). NOTE It is the practice in some countries for the mechanical power available at the shafts of motors to be expressed in horsepower (1 h.p. is equivalent to 745,7 W; 1 ch (cheval or metric horsepower) is equivalent to 736 W). | | P |
| 5.5.4 | Synchronous condensers. 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 | | - |
| 5.6.1 | DC generators 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 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 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 follows: Rated voltage.....Minimum. rated output (kV).....(kW/kVA) 1,0 < UN ≤ 3,0.....100 3,0 < UN ≤ 6,0..... 150 6,0 < UN ≤ 11,0..... 800 11,0 < UN ≤ 15,0..... 2 500 | Less than 1kV | N/A |

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|------------|--|-------------------------|---------|
| Clause | Requirement Test | Result – Value – Remark | Verdict |
| 5.8 | <p>Machines with more than one rating</p> <p>For machines with more than one rating, the machine shall comply with this standard in all respects at each rating.</p> <p>For multi-speed motors, a rating shall be assigned for each speed.</p> <p>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.</p> | | N/A |
| 6 | Site operating conditions | | - |
| 6.1 | <p>General</p> <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 8.</p> | | P |
| 6.2 | <p>Altitude</p> <p>The altitude shall not exceed 1000 m above sea-level.</p> | | P |
| 6.3 | <p>Maximum ambient air temperature</p> <p>The ambient air temperature shall not exceed 40 °C.</p> | Not exceed 40 °C | P |
| 6.4 | <p>Minimum ambient air temperature</p> <p>The ambient air temperature shall not be less than -15 °C for any machine.</p> <p>The ambient air temperature shall not be less than 0 °C for a machine with any of the following:</p> <ul style="list-style-type: none"> a) rated output greater than 3 300 kW (or kVA) per 1000 min⁻¹; b) rated output less than 600 W (or VA); c) a commutator; d) a sleeve bearing; e) water as a primary or secondary coolant; | Not be less than -15 °C | P |
| 6.5 | <p>Water coolant temperature</p> <p>For the reference water coolant temperature see Table 4, For other water coolant temperatures Table 9. The water coolant temperature shall not be less than +5 °C.</p> | No such construction. | N/A |

| EN 60034-1 | | | |
|----------------|---|-------------------------|---------|
| Clause | Requirement Test | Result – Value – Remark | Verdict |
| 6.6 | Storage and transport 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 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. NOTE For safety reasons, the hydrogen content should at all times be maintained at 90 % or more, it being assumed that the other gas in the mixture is air. 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 re-cooled gas, unless otherwise agreed. Windage losses shall be calculated at the corresponding density | No such construction. | N/A |
| 7 | Electrical operating conditions | | - |
| 7.1 | Electrical supply For three-phase a.c. machines, 50 Hz or 60 Hz, intended to be directly connected to distribution or utilization systems, the rated voltages shall be derived from the nominal voltages given in IEC 60038. | | P |
| 7.2 | Form and symmetry of voltages and currents | | - |
| 7.2.1 | AC motors | | - |
| 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: 0,02 for single phase motors and three phase motors, including synchronous motors but excluding motors of design N (see IEC 60034-12), unless the manufacturer declares otherwise; 0,03 for design N motors. | | P |

| EN 60034-1 | | | |
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| Clause | Requirement Test | Result – Value – Remark | Verdict |
| | <p>The HVF shall be computed by using the following formula:</p> $HCF = \sqrt{\sum_{n=2}^k u_n^2}$ <p>where</p> <p>u_n is the ratio of the harmonic voltage U_n to rated voltage U_N;</p> <p>n is the order of harmonic (not divisible by three in the case of three-phase a.c. motors).</p> <p>$k = 13$</p> | | N/A |
| | <p>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.</p> <p>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 deleterious temperature in the motor and it is recommended that the excess resulting temperature rise or temperature related to the limits specified in this standard should be not more than approximately 10 K.</p> | | N/A |
| 7.2.1.2 | <p>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> <p>NOTE When the supply voltage is significantly non-sinusoidal, for example from static converters, the r.m.s. value of the total waveform and of the fundamental are both relevant in determining the performance of an a.c. machine.</p> | | N/A |
| 7.2.2 | <p>AC generators</p> <p>Three-phase a.c generators shall be suitable for supplying circuits which, when supplied by a system of balanced and sinusoidal voltage:</p> <p>result in currents not exceeding a harmonic current factor (HCF) of 0,05, and</p> <p>result in a system of currents where neither the negative-sequence component nor the zero-sequence component exceed 5% of the positive component.</p> | | N/A |

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| Clause | Requirement Test | Result – Value – Remark | Verdict |
| | <p>The HCF shall be computed by the using following formula:</p> $HCF = \sqrt{\sum_{n=2}^k i_n^2}$ <p>Where</p> <p>i_n is the ratio of harmonic current I_n to the rated current I_N ;</p> <p>n is the order of harmonic;</p> <p>$k = 13$.</p> | | N/A |
| | <p>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 be not more than approximately 10 K.</p> | | N/A |
| 7.2.3 | <p>Synchronous machines</p> <p>Unless otherwise specified, three-phase synchronous machines shall be capable of operating continuously on an unbalanced system in such away 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 1 and under fault conditions shall be capable of operation with the product (I2IN)2 and time (t) not exceeding the values in Table 1.</p> | | N/A |
| | Table 1 – Unbalanced operating conditions for synchronous machines | | N/A |
| 7.2.4 | <p>DC motors supplied from static power converters</p> <p>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.</p> | | N/A |
| | <p>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.</p> | | N/A |

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| Clause | Requirement Test | Result – Value – Remark | Verdict |
| | <p>The static power converter supply shall be characterized by means of an identification code, as follows:</p> <p>where</p> <p>CCC is the identification code for converter connection according to IEC 971;</p> <p>UaN consists of three or four digits indicating the rated alternating voltage at the input terminals of the converter, in volts;</p> <p>f consists of two digits indicating the rated input frequency, in hertz;</p> <p>L consists of one, two or three digits indicating the series inductance to be added externally to the motor armature circuit, in millihenrys. If this is zero, it is omitted.</p> | | N/A |
| | <p>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.</p> | | N/A |
| | <p>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.</p> | | N/A |
| 7.3 | <p>Voltage and frequency variations during operation</p> <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> | | N/A |
| | <p>For d.c. machines, when directly connected to a normally constant d.c. bus, zones A and B apply only to the voltages.</p> | | N/A |

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| Clause | Requirement Test | Result – Value – Remark | Verdict |
| | 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 Figure 11 and Figure 12), and may exhibit some deviations. Temperature rises may be higher than at rated voltage and frequency. | | 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. | | P |
| 7.4 | <p>Three-phase a.c. machines operating on unearthed systems</p> <p>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.</p> <p>If the winding does not have the same insulation at the line and neutral ends, this shall be stated by the manufacturer.</p> | | N/A |
| 7.5 | <p>Voltage (peak and gradient) withstand levels</p> <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> <p>For cage induction motors within the scope of IEC 60034-12, see also IEC 60034-17.</p> <p>For high-voltage a.c. motors, see also IEC 60034-15.</p> | | N/A |
| 8 | Thermal performance and tests | | - |
| 8.1 | <p>Thermal class</p> <p>A thermal class in accordance with IEC 60085 shall be assigned to the insulation systems used in machines. 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> | Class: F | P |

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| Clause | Requirement Test | Result – Value – Remark | Verdict |
| 8.2 | Reference coolant The reference coolant for a given method of cooling the machine is specified in Table 4. | Air | 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 |
| | NOTE A machine may be so arranged and cooled that more than one item of Table 4 applies, in which case different reference coolants may apply for different windings. | | N/A |
| 8.3 | Conditions for thermal tests | | - |
| 8.3.1 | Electrical supply 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. 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 If the temperature of a winding is to be determined from the increase of resistance, the initial winding shall not differ from the coolant by more than 2 K. | | 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 5 K of the temperature of the coolant. | | N/A |
| 8.3.3 | Temperature of coolant 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). | See clause 8.6.2.2 | P |

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| Clause | Requirement Test | Result – Value – Remark | Verdict |
| 8.3.4 | <p>Measurement of coolant temperature during test</p> <p>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 variations.</p> | | P |
| 8.3.4.1 | <p>Open machines or closed machines without heat exchangers (cooled by surrounding ambient air or gas)</p> <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 and draughts.</p> | Cooled by surrounding ambient air. | P |
| 8.3.4.2 | <p>Machines cooled by air or gas from a remote source through ventilation ducts and machines with separately mounted heat exchangers</p> <p>The temperature of the primary coolant shall be measured where it enters the machine.</p> | | N/A |
| 8.3.4.3 | <p>Closed machines with machine-mounted or internal heat exchangers</p> <p>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</p> | | N/A |
| 8.4 | <p>Temperature rise of a part of a machine</p> <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> <p>For comparison with the limits of temperature rise (see Table 7 or Table 8) or of temperature (see Table 11), 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> | | P |
| | <p>When this is not possible, for example, when using the direct measurement of resistance method, see 8.6.2.3.</p> | | P |

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| Clause | Requirement Test | Result – Value – Remark | Verdict |
| | 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/A |
| 8.5 | Methods of measurement of temperature | | - |
| 8.5.1 | <p>General</p> <p>Three methods of measuring the temperature of windings and other parts are recognized:</p> <ul style="list-style-type: none"> - resistance method; - embedded temperature detector (ETD) method; - thermometer method. <p>Different methods shall not be used as a check upon one another.</p> | | P |
| | For indirect testing IEC 60034-29 | | N/A |
| 8.5.2 | <p>Resistance method</p> <p>The temperature of the windings is determined from the increase of the resistance of the windings</p> | | P |
| 8.5.3 | <p>Embedded temperature detector (ETD) method</p> <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> | | P |
| 8.5.4 | <p>Thermometer method</p> <p>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.</p> | | N/A |
| 8.6 | Determination of winding temperature | | - |
| 8.6.1 | <p>Choice of method</p> <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> | | 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/A |

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| Clause | Requirement Test | Result – Value – Remark | Verdict |
| | For a.c. machines having a rated output less than 5 000 kW (or kVA) but greater than 200 kW (or kVA) the manufacture shall choose either the resistance or the ETD method, unless otherwise agreed | | N/A |
| | For a.c. machines having a rated output less than or equal to 200 kW (or kVA) the manufacture shall choose the direct measurement version or the superposition version of 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 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/A |
| | 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 ample, 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 |
| | NOTE For checking the temperature of such windings in service, an embedded detector at the bottom of the slot is of little value because it gives mainly the temperature of the iron core. A detector placed between the coil and the wedge will follow the temperature of the Winding much more closely and is, therefore, better for checks in service. Because the temperature there may be rather low the relation between and the temperature measured by the resistance method should be determined by a thermal test. | | 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 |

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| Clause | Requirement Test | Result – Value – Remark | Verdict |
| | For windings of armatures having commutators and for field windings, except for field windings in cylindrical rotors of synchronous machines, 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. | | N/A |
| 8.6.2 | Determination by resistance method | | - |
| 8.6.2.1 | Measurement One of the following methods shall be used. | | P |
| | Direct measurement 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 For d.c. windings: by measuring the current in and the voltage across the winding, using instruments having suitable ranges. For a.c. windings, by injecting direct current into the winding When de-energized. | | P |

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| Clause | Requirement Test | Result – Value – Remark | Verdict |
| 8.6.2.2 | <p>Calculation</p> <p>The temperature rise, $\theta_2 - \theta_a$, may be obtained from the equation:</p> $(\theta_2 + k) / (\theta_1 + k) = R_2 / R_1$ <p>where</p> <p>θ_1 is the temperature (°C) of the winding (cold) at the moment of the initial resistance measurement;</p> <p>θ_2 is the temperature (°C) of the winding at the end of the thermal test;</p> <p>θ_a is the temperature of the coolant at the end of the thermal test;</p> <p>R_1 is the resistance of the winding at temperature θ_1 (cold);</p> <p>R_2 is the resistance of the winding at the end of the thermal test;</p> <p>k is the reciprocal of the temperature coefficient of resistance at 0 °C of the conductor material.</p> <p>For copper $k = 235$</p> <p>For aluminium $k = 225$ unless specified otherwise.</p> <p>For practical, purposes, the following alternative formula may be found convenient:</p> $\theta_2 - \theta_a = (R_2 - R_1) \times (1 / R_1) \times (k + \theta_1) + \theta_1 - \theta_a$ | | P |
| 8.6.2.3 | Correction or stopping time | | - |
| 8.6.2.3.1 | <p>General</p> <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> | | P |
| 8.6.2.3.2 | <p>Short stopping time</p> <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> | Stopping time meets the table 5 | P |
| | Table 5 – Time interval | | P |

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| Clause | Requirement Test | Result – Value – Remark | Verdict |
| 8.6.2.3.3 | <p>Extended stopping time</p> <p>If a resistance reading cannot be made in the time interval specified in Table 5, it shall be made as soon as possible but after not more than twice the interval 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 time interval 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.</p> | No such case | N/A |
| | <p>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.</p> | | N/A |
| 8.6.2.3.4 | <p>Windings with one coil-side per slot</p> <p>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.</p> | | N/A |
| 8.6.3 | <p>Determination by ETD method</p> <p>The detectors shall be suitably distributed throughout the winding and the number of detectors installed shall not be less than six.</p> <p>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.</p> <p>The highest reading from the ETD elements shall be used to determine the temperature of the winding.</p> <p>NOTE ETD elements or their connections may fail and give incorrect readings. Therefore, if one or more readings are shown to be erratic, after investigation they should be eliminated.</p> | | N/A |

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| Clause | Requirement Test | Result – Value – Remark | Verdict |
| 8.6.3.1 | <p>Two or more coil-sides per slot</p> <p>The detectors shall be located between the insulated coil-sides within the slot in positions at which the highest temperatures are likely to occur.</p> | | N/A |
| 8.6.3.2 | <p>One coil-side per slot</p> <p>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.</p> | | N/A |
| 8.6.3.3 | <p>End windings</p> <p>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.</p> | | N/A |
| 8.6.4 | <p>Determination by the thermometer method</p> <p>When a non-embedded thermocouple or a resistance thermometer is used, it shall not be placed at a point inaccessible to a bulb thermometer.</p> <p>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.</p> <p>The highest reading from any thermometer shall be taken to be the temperature of the winding or other part of the machine. a</p> | | N/A |
| 8.7 | Duration of thermal tests | | - |
| 8.7.1 | <p>Rating for continuous running duty</p> <p>The test shall be continued until thermal equilibrium has been reached.</p> | The thermal equilibrium had been reached when the temperature rising less than 2k per hour. | P |
| 8.7.2 | <p>Rating for short-time duty</p> <p>The duration of the test shall be the time given in the rating.</p> | S1 | N/A |

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| Clause | Requirement Test | Result – Value – Remark | Verdict |
| 8.7.3 | <p>Rating for periodic duty</p> <p>Normally the rating for equivalent loading assigned by the manufacturer (see 5.2.6) 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 2 K per hour. If necessary, measurements shall be taken at reasonable intervals over a period of time.</p> | | N/A |
| 8.7.4 | <p>Ratings for non-periodic duty and for duty with discrete constant loads</p> <p>The rating for equivalent loading assigned by the manufacturer (see 5.2.6) shall be applied until thermal equilibrium has been reached.</p> | | N/A |
| 8.8 | Determination of the thermal equivalent time constant for machine of duty 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 (i.e. $1/\ln 2$ 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> <p>The measuring point shall be as near as possible to one of the two locations specified in Table 6.</p> | | 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. | | P |
| | Table 6– Measuring points | | P |
| 8.10 | Limits of temperature and of temperature rise | | - |

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| Clause | Requirement Test | Result – Value – Remark | Verdict |
| | 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. The limits are stated relative to the reference coolant specified in Table 4.A rule is given to allow for the purity of hydrogen coolant. | | P |
| 8.10.1 | Indirect cooled windings Temperature rises under reference conditions shall not exceed the limits given in Table 7 (air coolant) or Table 8 (hydrogen coolant) as appropriate. | | P |
| | For other operating site conditions, for ratings other than continuous running duty, and for rated voltages greater than 12 000V, the limits shall be adjusted according to Table 8. (See also Table 10 for limit on coolant temperature which is assumed in 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 testing 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 |
| | Table 7 - Limits of temperature rise of windings indirectly cooled by air | | N/A |
| | Table 8 Limits of temperature rise of windings indirectly cooled by hydrogen | | N/A |
| | Table 9 - Adjustments to limits of temperature rise at the operating site of indirect cooled windings to take account of non-reference operating conditions and ratings | | N/A |
| | Table 10 - Assumed maximum ambient temperature | | N/A |

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| Clause | Requirement Test | Result – Value – Remark | Verdict |
| 8.10.2 | <p>Direct cooled windings</p> <p>Temperatures under reference conditions shall not exceed the limits given in Table 12. For other operating site conditions the limits shall be adjusted according to Table 13. 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. 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.</p> | | N/A |
| 8.10.3 | <p>Adjustments to take account of hydrogen purity on test</p> <p>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 %.</p> | | N/A |
| 8.10.4 | <p>Permanently short-circuited windings, magnetic cores and all structural components (other than bearings) whether or not in contact with insulation</p> <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> | | N/A |
| 8.10.5 | <p>Commutators and sliprings, open or enclosed and their brushes and brushgear</p> <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. 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> | | N/A |
| 9 | Other performance and tests | | - |
| 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> | | N/A |

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| Clause | Requirement Test | Result – Value – Remark | Verdict |
| | The minimum test schedule is listed in Table 15 and is applicable for machines with rated output = 20 MW (MVA). Additional routine tests may be performed especially on machines with ratings above 200 kW (kVA). The term synchronous machines include permanent magnet machines. | | N/A |
| | For d.c. machines, depending on size and design, a commutation test under may be performed as a routine test. | | N/A |
| 9.2 | Withstand voltage test | | - |
| | 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. | 1800V/1min subjected between the U,V,W and metal enclosure | P |
| | In the case of polyphase machines with rated voltage above 1 kV 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 6 kV 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/A |
| | 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 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. | | P |

| EN 60034-1 | | | |
|------------|--|-------------------------|---------|
| Clause | Requirement Test | Result – Value – Remark | 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 a 120 % of the 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. | | N/A |
| | 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. 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. 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 1000 V if the rated voltage is equal to or greater than 100 V and a minimum of 500 V if the rated voltage is less than 100 V. | | N/A |
| | Table -16 Withstand voltage tests | | P |
| 9.3 | Occasional excess current | | - |

| EN 60034-1 | | | |
|------------|---|--|---------|
| Clause | Requirement Test | Result – Value – Remark | Verdict |
| 9.3.1 | <p>General</p> <p>The excess current capability of rotating machines is given for the purpose of co-ordinating these machines 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.</p> <p>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> <p>NOTE For the capability of synchronous machines concerning the occasional negative- sequence component of current under fault conditions, see 7.2.3.</p> | | P |
| 9.3.2 | <p>Generators</p> <p>AC generators having rated outputs not exceeding 1200 MVA shall be capable of withstanding a current equal to 1,5 times the rated current for not less than 30 s.</p> <p>AC generators having rated outputs above 1200 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 less than 15 s.</p> | | N/A |
| 9.3.3 | <p>Motors (except commutator motors and permanent magnet motors)</p> <p>Polyphase motors having rated outputs not exceeding 315 kW and rated voltages not exceeding 1 kV shall be capable of withstanding:</p> <ul style="list-style-type: none"> - a current equal to 1,5 times the rated current for not less than 2 min. <p>NOTE Polyphase motors having rated outputs above 315 kW and all single-phase motors, no occasional excess current is specified.</p> | <p>Tested with positive result. under 1.5 times the rated current for 2 mins</p> | P |

| EN 60034-1 | | | |
|--------------|--|-------------------------|---------|
| Clause | Requirement Test | Result – Value – Remark | Verdict |
| 9.3.4 | <p>Commutator machines</p> <p>A commutator machine shall be capable of withstanding, for 60 s, 1,5 times rated current under the appropriate combination of conditions as follows:</p> <p>a) speed:</p> <ol style="list-style-type: none"> 1) d.c. motor: highest full-field speed; 2) d.c. generator: rated speed; 3) a.c. commutator motor: highest full-field speed; <p>b) armature voltage: that corresponding to the specified speed.</p> | | N/A |
| 9.4 | Momentary excess torque for motors | | - |
| 9.4.1 | <p>Polyphase induction motors and d.c. motors</p> <p>Motors, whatever their duty and construction, be capable of withstanding an excess torque of at least 60 % of their rated torque for 15 s without stalling or abrupt change in speed (under gradual increase of torque). The voltage and frequency (induction motors) being maintained at their rated value.</p> <p>NOTE Higher torques are required for some motors manufactured according to IEC 60034-12.</p> | | P |
| | For d.c. motors, the torque shall be expressed in terms of overload current; | | P |
| | Motors for duty type S9 shall be capable of withstanding momentarily an excess torque determined according to the duty specified. | | N/A |
| | NOTE For an approximate determination of the changes in temperature due to the course of the current-related losses, the thermal equivalent time constant, determined according to 8.8 may be used. | | N/A |
| | Motors intended for specific applications that require a high torque (for example for hoisting) shall be the subject of agreement. | | N/A |
| | For cage-type induction motors specially designed to ensure a starting current less than 4,5 times the rated current, the excess torque can be below the figure 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 |

| EN 60034-1 | | | |
|------------|---|-------------------------|---------|
| Clause | Requirement Test | Result – Value – Remark | Verdict |
| 9.4.2 | <p>Polyphase synchronous motors</p> <p>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 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 equipment operating under normal conditions:</p> <p>-synchronous (wound rotor) induction motors: 35 % excess torque;</p> <p>-synchronous (cylindrical rotor) motors: 35 % excess torque;</p> <p>-synchronous (salient pole) motors: 50 % excess torque.</p> | | N/A |
| 9.4.3 | <p>Other motors</p> <p>The momentary excess torque for single-phase, commutator and other motors shall be the subject of agreement.</p> | | N/A |
| 9.5 | <p>Pull-up torque</p> <p>Unless otherwise specified, (for example machines according to IEC 60034-12), the pull-up torque of cage induction motors under full voltage shall not be less than 0,3 times the rated torque.</p> | | N/A |
| 9.6 | <p>Safe operating speed of cage induction motors</p> <p>All three-phase single-speed cage induction motors of frame number up to and including 315 and for voltages up to and including 1000 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.</p> | | N/A |
| | <p>Table 17 - Maximum safe operating speed (min-1) of three-phase single-speed cage induction motors for voltages up to and including 690 V</p> | | N/A |
| 9.7 | <p>Overspeed</p> | | - |


| EN 60034-1 | | | |
|------------|---|-------------------------|---------|
| Clause | Requirement Test | Result – Value – Remark | Verdict |
| | <p>Machines shall be designed to withstand the speeds specified in Table 18. 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 with the required dielectric tests. The duration of any overspeed test shall be 2 min.</p> <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> | | N/A |
| | <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.</p> | | N/A |
| | Table 18 - Overspeeds | | N/A |
| 9.8 | <p>Short-circuit current for synchronous machines</p> <p>Unless otherwise specified, the peak value of the short-circuit current for synchronous machines, including turbine-type machines not covered by IEC 34-3, 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.</p> <p>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> | | N/A |
| 9.9 | <p>Short-circuit withstand test for synchronous machines</p> | | - |
| | <p>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.</p> | | N/A |

| EN 60034-1 | | | |
|---------------|---|-------------------------|---------|
| Clause | Requirement Test | Result – Value – Remark | Verdict |
| | 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 3 s. | | N/A |
| | 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 turbine-type machines, see IEC 60034-3. | | N/A |
| 9.10 | Commutation test for commutator machines | | - |
| | 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 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 performed in warm conditions. | | N/A |
| 9.11 | Total Harmonic Distortion (THD) for synchronous machines | | - |
| 9.11.1 | General 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 2/3Hz to 100 Hz inclusive, with a view to minimizing interference caused by the machines. | | N/A |
| 9.11.2 | Limits 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/A |
| | NOTE Limiting values of individual harmonies are not specified as it is considered that machines which meet the above requirements will operate satisfactory. | | N/A |

| EN 60034-1 | | | |
|---------------|--|-------------------------|---------|
| Clause | Requirement Test | Result – Value – Remark | Verdict |
| 9.11.3 | <p>Tests</p> <p>Type tests shall be carried out on a.c. machines to verify compliance with 8.10.2. The range of frequencies measured shall cover all harmonics from rated frequency up to 100th harmonic. 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:</p> | | N/A |
| | $THD = \sqrt{\sum_{n=2}^k u_n^2}$ <p>where</p> <p>u_n is the r.m.s. value of the line-to-line terminal voltage U_n of the machine to the line-to-line terminal fundamental voltage U_1 of the machine;</p> <p>n is the order of harmonic;</p> <p>$k = 100$</p> | | N/A |
| 10 | Rating plates | | - |
| 10.1 | <p>General</p> <p>Every electrical machine shall be provided with a rating plate(s). The plates shall be made of durable material and be securely mounted.</p> <p>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 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> | | P |

| EN 60034-1 | | | |
|-------------|--|---------------------------|---------|
| Clause | Requirement Test | Result – Value – Remark | Verdict |
| 10.2 | <p>Marking</p> <p>For machines with rated outputs up to and including 750 W (or VA) and dimensions not covered by IEC 60072 shall be marked with 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 WA), items a, b, k and l shall be marked as a minimum and item z may be provided in another form.</p> <p>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> <p>If the manufacturer gives more information, this need not necessarily be marked on the rating plate(s).</p> | Details refer to markings | 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. | | P |
| | b) The manufacturer's serial number, or identification mark. | | 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. | | N/A |
| | d) The manufacturer's machine code. | | P |
| | e) For a.c. machines, the number of phases. | | 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. | EN 60034-1 | P |
| | g) The degree of protection provided by the enclosures (IP code) in accordance with IEC 60034-5. | IP55 | 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 | | P |

| EN 60034-1 | | | |
|------------|--|-------------------------|---------|
| Clause | Requirement Test | Result – Value – Remark | Verdict |
| | i) The thermal class and the limit of temperature or of temperature rise (when lower than that of the thermal classification) 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 clause 8.2). This information shall be given for both stator and rotor (separated by a slash) when their thermal classification differ. | Class F | 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. | | P |
| | l) The rated voltage(s) or range of rated voltage. | | 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: For example ~ 50 Hz/--- or a.c. 50 Hz/d.c. | | 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. | | P |
| | p) The rated speed(s) or range of rated speed. | | 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). | COSφ0.95 | P |
| | t) For wound-rotor induction machines, the rated open-circuit voltage between slip-rings and the rated slip-ring current. | | N/A |

| EN 60034-1 | | | |
|-------------|--|-------------------------|---------|
| Clause | Requirement Test | Result – Value – Remark | Verdict |
| | 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 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 1000 m above sea-level). | | N/A |
| | y) For hydrogen-cooled machines, the hydrogen pressure rated output. | | N/A |
| | z) When specified, the approximate total mass of the machine, if exceeding 30 kg. | 15.2kg | N/A |
| | 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. | | 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). | 230V/400V | P |
| | Except for normal maintenance, when a machine is repaired or refurbished an additional plate shall be provided to indicate the repair the name of the company undertaking the work, the year of repair and the changes made. | | N/A |
| 11 | Miscellaneous requirements | | - |
| 11.1 | Protective earthing of machines Machines shall be provided with means a earthing terminal to another device to permit the connection of a protective conductor or a earthing conductor.  The symbol or legend shall identify this device. However, | | P |

| EN 60034-1 | | | |
|------------|--|-------------------------|---------|
| Clause | Requirement Test | Result – Value – Remark | Verdict |
| | <p>machines shall never be earthed nor be provided with an earthing terminal when:</p> <p>a) they are fitted with supplementary insulation, or;</p> <p>b) they are intended for assembly in apparatus having supplementary insulation, or;</p> <p>c) they have rated voltages up to 50 V d.c or 120V d.c and are intended for use on SELV circuits.</p> <p>NOTE The SELV is defined in IEC 60884-2-4.</p> | | N/A |
| | <p>In the case of machines having rated voltages greater than 50 V a.c. or 120 V d.c., but not exceeding 1000 V a.c. or 1500 V d.c., the terminal for the earth 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 earth terminal fitted on the frame.</p> | | N/A |
| | <p>Machines for rated voltages greater than 1000 V a.c. or 1500 V d.c. shall have an earth 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.</p> | | P |
| | <p>The earth terminal shall be designed to ensure a good connection with the earth conductor without any damage to the conductor or terminal. Accessible conducting parts which are not part of the operating circuit shall have a good electrically conducting connection with each other and with the earth terminal. When all bearings and the rotor winding of a machine are insulated, the shaft shall be electrically connected to the earth terminal, unless the manufacturer and the purchaser agree to alternative means of protection.</p> | | N/A |
| | <p>When an earth terminal is provided in the terminal box, it shall be assumed that the earth conductor is made of the same metal as the live conductors.</p> | | P |
| | <p>When an earth terminal is provided on the frame, the earth 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.</p> | | P |
| | <p>The earth terminal shall be designed to accommodate an earth conductor of cross-sectional area in accordance with Table 19. If an earth 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.</p> | | N/A |

| EN 60034-1 | | | |
|-------------|--|-------------------------|---------|
| Clause | Requirement Test | Result – Value – Remark | Verdict |
| | For other cross-sectional areas of live conductors, the earth or protective conductor shall have a cross-sectional area at least equivalent to: - that of the live conductor for cross-sectional areas less than 25 mm ² -25 mm ² for cross-sectional areas between 25 mm ² and 50 mm ² ; - 50 % of that of the live conductor for cross-sectional areas exceeding 50 mm ² . | | N/A |
| | The earth terminal shall be identified in accordance with IEC 60445. | | N/A |
| | Table 19 -Cross-sectional areas of earth conductors | | 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. | | P |
| 12 | Tolerances | | - |
| 12.1 | General | | N/A |
| | 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. NOTE In case of a series production the tolerance applies to any selected sample, i.e. tolerance covers variations in raw material properties and manufacturing procedures. | | N/A |
| 12.2 | Tolerances on values of quantities | | - |
| | Unless stated otherwise, tolerances on declared values shall be as specified in Table 20. | | N/A |
| | Table 20- Schedule of tolerances on values of quantities | | N/A |
| 13 | Electromagnetic compatibility (EMC) | | N/A |
| | Not considered in this report | | N/A |
| 14 | Safety | | - |

| EN 60034-1 | | | |
|------------|---|-------------------------|---------|
| Clause | Requirement Test | Result – Value – Remark | Verdict |
| | <p>Safety</p> <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 appliance, 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> <p>NOTE It is the responsibility of the manufacturer or assembler of equipment incorporating electrical machines as components to ensure that the overall equipment is safe.</p> <p>This may involve consideration of relevant product standards such as:</p> | | P |
| | <p>IEC 60079: Electrical apparatus for explosive gas atmospheres.</p> <p>And other parts of IEC 60034 including: IEC60034-5, IEC60034-7, IEC60034-8, IEC60034-11 and IEC60034-12..</p> <p>In addition, it may be necessary to consider limitation of the surface temperature and similar characteristics; see for example IEC 60335-1, clause 11: Heating.</p> | | N/A |

--- End of Main Report ---

Annex 1: Temperature Data

| | | | | | | | |
|--|---|---------------|----------------|----------------|---------------------|-------------------------|----------|
| Model | Y2-90L-2-1.5kW-B3 | | | | | | |
| 8.10 | TABLE: Heating test, resistance method | | | | | | P |
| | Test voltage (V)..... | 230 V | | | | — | |
| | Ambient, t1 (°C) | 15,0 °C | | | | — | |
| | Ambient, t2 (°C) | 19,2 °C | | | | — | |
| Temperature rise of winding: | | R1 (Ω) | R2 (Ω) | Δ T (K) | Max. Δ T (K) | Insulation class | |
| Winding | | 2,862 | 3,463 | 48,30 | 105 | F | |
| 9.3 | Occasional excess current | | | | | | |
| Test requirements | Voltage (V) | Current(A) | Input Power(W) | Torque (N.m) | Speed (r/min) | Output power(W) | |
| Run at 1.5 times rated current for 2 minutes | 229,4 | 9,0 | 3176,96 | 8,26 | 2788 | 2411,4 | |
| 9.4 | Momentary excess torque | | | | | | |
| Test requirements | Voltage (V) | Current (A) | Input power(W) | Torque (N.m) | Speed (r/min) | Output power(W) | |
| Run at 1.6 times rated torque Polyphase induction motor and d. c. motor | 229,5 | 8,31 | 2890,94 | 7,64 | 2817 | 2253,6 | |
| 8.10 | TABLE: Heating test, resistance method | | | | | | P |
| | Test voltage (V)..... | 400 V | | | | — | |
| | Ambient, t1 (°C) | 16,4 °C | | | | — | |
| | Ambient, t2 (°C) | 18,4 °C | | | | — | |
| Temperature rise of winding: | | R1 (Ω) | R2 (Ω) | Δ T (K) | Max. Δ T (K) | Insulation class | |
| Winding | | 8,838 | 10,480 | 44,71 | 105 | F | |
| 9.3 | Occasional excess current | | | | | | |
| Test requirements | Voltage (V) | Current(A) | Input Power(W) | Torque (N.m) | Speed (r/min) | Output power(W) | |
| Run at 1.5 times rated current for 2 minutes | 399,5 | 5,25 | 3234,34 | 8,39 | 2762 | 2426,5 | |
| 9.4 | Momentary excess torque | | | | | | |
| Test requirements | Voltage (V) | Current (A) | Input power(W) | Torque (N.m) | Speed (r/min) | Output power(W) | |
| Run at 1.6 times rated torque Polyphase induction motor and d. c. motor | 399,6 | 4,75 | 2884,46 | 7,64 | 2803 | 2242,4 | |

Annex 1: Temperature Data

| | | | | | | | |
|--|---|---------------|----------------|----------------|---------------------|-------------------------|----------|
| Model | Y2-90L-2-2.2kW-B3 | | | | | | |
| 8.10 | TABLE: Heating test, resistance method | | | | | | P |
| | Test voltage (V)..... | 400 V | | | | — | |
| | Ambient, t1 (°C) | 16,7 °C | | | | — | |
| | Ambient, t2 (°C) | 18,6 °C | | | | — | |
| Temperature rise of winding: | | R1 (Ω) | R2 (Ω) | Δ T (K) | Max. Δ T (K) | Insulation class | |
| Winding | | 5,663 | 7,864 | 95,93 | 105 | F | |
| 9.3 | TABLE: Occasional excess current | | | | | | |
| Test requirements | Voltage (V) | Current(A) | Input Power(W) | Torque (N.m) | Speed (r/min) | Output power(W) | |
| Run at 1.5 times rated current for 2 minutes | 399,5 | 7,06 | 4469,23 | 11,49 | 2721 | 3273,7 | |
| 9.4 | TABLE: Momentary excess torque | | | | | | |
| Test requirements | Voltage (V) | Current (A) | Input power(W) | Torque (N.m) | Speed (r/min) | Output power(W) | |
| Run at 1.6 times rated torque Polyphase induction motor and d. c. motor | 399,4 | 7,13 | 4529,73 | 11,65 | 2702 | 3296,2 | |

| | | | | | | | |
|--|---|---------------|----------------|----------------|---------------------|-------------------------|----------|
| Model | Y2-100-2-3kW-B3 | | | | | | |
| 8.10 | TABLE: Heating test, resistance method | | | | | | P |
| | Test voltage (V)..... | 400 V | | | | — | |
| | Ambient, t1 (°C) | 19,2 °C | | | | — | |
| | Ambient, t2 (°C) | 23,3 °C | | | | — | |
| Temperature rise of winding: | | R1 (Ω) | R2 (Ω) | Δ T (K) | Max. Δ T (K) | Insulation class | |
| Winding | | 4,263 | 6,014 | 100,31 | 105 | F | |
| 9.3 | TABLE: Occasional excess current | | | | | | |
| Test requirements | Voltage (V) | Current(A) | Input Power(W) | Torque (N.m) | Speed (r/min) | Output power(W) | |
| Run at 1.5 times rated current for 2 minutes | 399,0 | 9,59 | 5990,56 | 15,34 | 2843 | 4566,7 | |
| 9.4 | TABLE: Momentary excess torque | | | | | | |
| Test requirements | Voltage (V) | Current (A) | Input power(W) | Torque (N.m) | Speed (r/min) | Output power(W) | |
| Run at 1.6 times rated torque Polyphase induction motor and d. c. motor | 399,0 | 10,32 | 6517,15 | 16,368 | 2818 | 4827,5 | |

Annex 1: Temperature Data

| | | | | | | | |
|--|---|---------------|----------------|----------------|---------------------|-------------------------|----------|
| Model | Y2-132S1-2-5.5kW-B3 | | | | | | |
| 8.10 | TABLE: Heating test, resistance method | | | | | | P |
| | Test voltage (V)..... | 400 V | | | | | — |
| | Ambient, t1 (°C) | 20,2 °C | | | | | — |
| | Ambient, t2 (°C) | 23,3 °C | | | | | — |
| Temperature rise of winding: | | R1 (Ω) | R2 (Ω) | Δ T (K) | Max. Δ T (K) | Insulation class | |
| Winding | | 4,238 | 5,963 | 100,77 | 105 | F | |
| 9.3 | TABLE: Occasional excess current | | | | | | |
| Test requirements | Voltage (V) | Current(A) | Input Power(W) | Torque (N.m) | Speed (r/min) | Output power(W) | |
| Run at 1.5 times rated current for 2 minutes | 398,8 | 16,05 | 9752,0 | 28,402 | 2822 | 8393,9 | |
| 9.4 | TABLE: Momentary excess torque | | | | | | |
| Test requirements | Voltage (V) | Current (A) | Input power(W) | Torque (N.m) | Speed (r/min) | Output power(W) | |
| Run at 1.6 times rated torque Polyphase induction motor and d. c. motor | 398,6 | 16,95 | 10250,0 | 29,975 | 2802 | 8795,0 | |

| | | | | | | | |
|--|---|---------------|----------------|----------------|---------------------|-------------------------|----------|
| Model | Y2-132S2-2-7.5kW-B3 | | | | | | |
| 8.10 | TABLE: Heating test, resistance method | | | | | | P |
| | Test voltage (V)..... | 400 V | | | | | — |
| | Ambient, t1 (°C) | 23,9 °C | | | | | — |
| | Ambient, t2 (°C) | 24,4 °C | | | | | — |
| Temperature rise of winding: | | R1 (Ω) | R2 (Ω) | Δ T (K) | Max. Δ T (K) | Insulation class | |
| Winding | | 0,865 | 1,196 | 98,57 | 105 | F | |
| 9.3 | TABLE: Occasional excess current | | | | | | |
| Test requirements | Voltage (V) | Current(A) | Input Power(W) | Torque (N.m) | Speed (r/min) | Output power(W) | |
| Run at 1.5 times rated current for 2 minutes | 398,2 | 21,53 | 13442,17 | 39,481 | 2818 | 11650,8 | |
| 9.4 | TABLE: Momentary excess torque | | | | | | |
| Test requirements | Voltage (V) | Current (A) | Input power(W) | Torque (N.m) | Speed (r/min) | Output power(W) | |
| Run at 1.6 times rated torque Polyphase induction motor and d. c. motor | 398,0 | 22,40 | 13862,55 | 40,906 | 2802 | 12085,15 | |

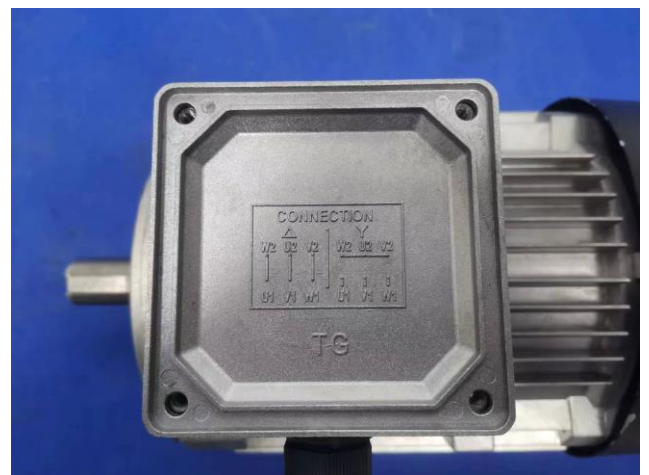
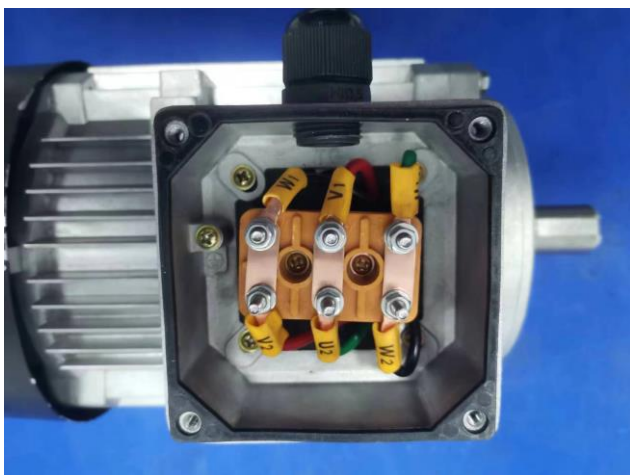
Annex 1: Temperature Data

| | | | | | | | |
|--|---|---------------|----------------|----------------|---------------------|-------------------------|---|
| Model | Y2-132S2-4-7.5kW-B3 | | | | | | |
| 8.10 | TABLE: Heating test, resistance method | | | | | | P |
| | Test voltage (V)..... : | 400 V | | | | | — |
| | Ambient, t1 (°C) | 23,9 °C | | | | | — |
| | Ambient, t2 (°C) | 24,4 °C | | | | | — |
| Temperature rise of winding: | | R1 (Ω) | R2 (Ω) | Δ T (K) | Max. Δ T (K) | Insulation class | |
| Winding | | 0,874 | 1,212 | 99,62 | 105 | F | |
| 9.3 | TABLE: Occasional excess current | | | | | | |
| Test requirements | Voltage (V) | Current(A) | Input Power(W) | Torque (N.m) | Speed (r/min) | Output power(W) | |
| Run at 1.5 times rated current for 2 minutes | 398,8 | 21,488 | 13302,17 | 71,68 | 1446,19 | 11535,64 | |
| 9.4 | TABLE: Momentary excess torque | | | | | | |
| Test requirements | Voltage (V) | Current (A) | Input power(W) | Torque (N.m) | Speed (r/min) | Output power(W) | |
| Run at 1.6 times rated torque Polyphase induction motor and d. c. motor | 398,5 | 22,326 | 13862,55 | 79,22 | 1444,78 | 11985,04 | |

-- End of Annex 1 ---

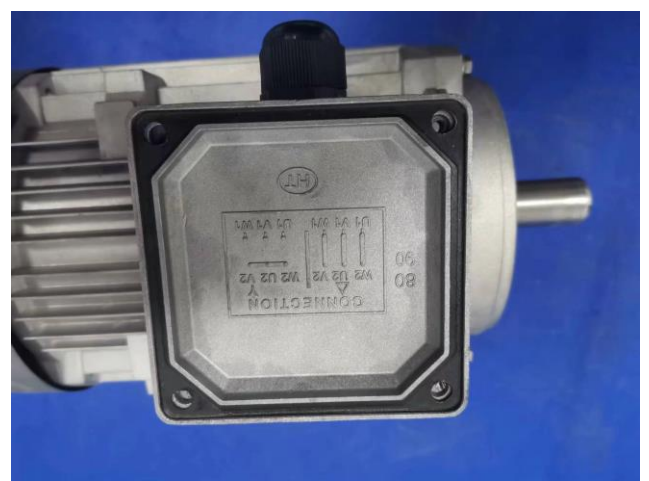
Annex2: Photo Documents

Y2-90L-2-1.5kW-B3



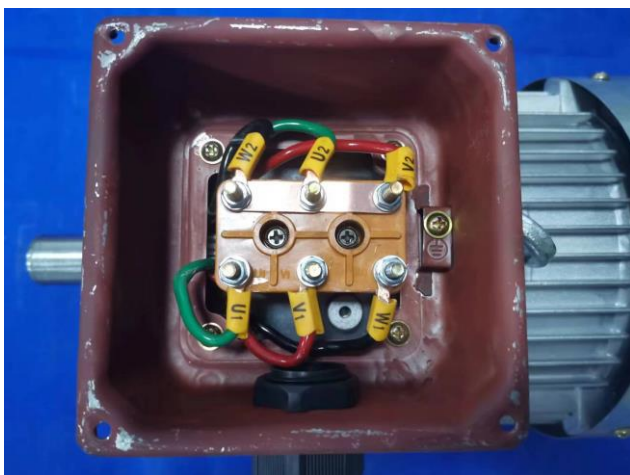
Annex2: Photo Documents

Y2-90L-2-2.2kW-B3



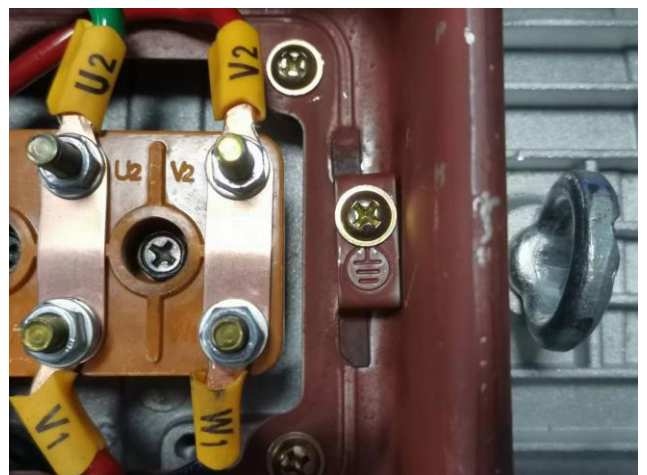
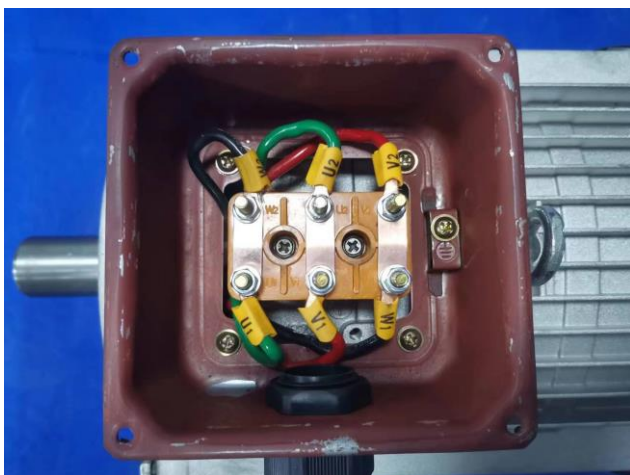
Annex2: Photo Documents

Y2-100-2-3kW-B3



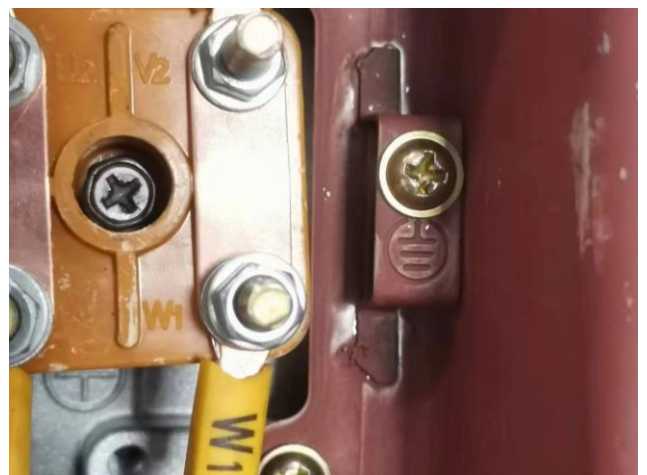
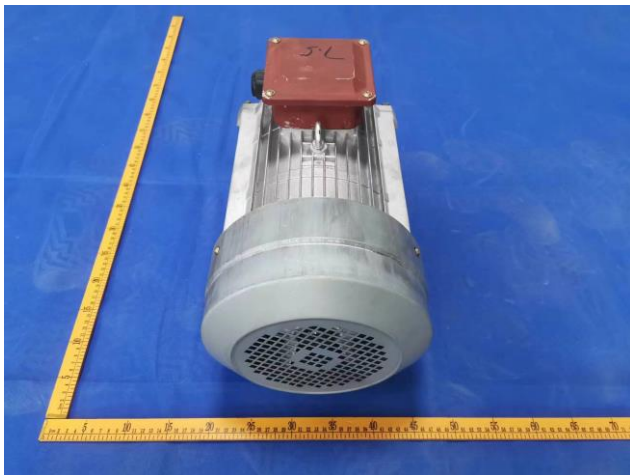
Annex2: Photo Documents

Y2-132S1-2-5.5kW-B3



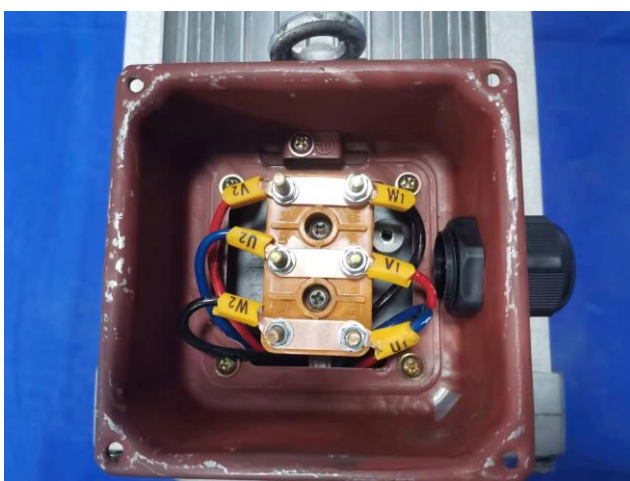
Annex2: Photo Documents

Y2-132S2-2-7.5kW-B3



Annex2: Photo Documents

Y2-132S2-4-7.5kW-B3



-- End of Annex 2 --