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Road vehicles — Alternators with regulators — Test methods and general requirements

Véhicules routiers — Alternateurs avec régulateur — Méthodes d'essai et conditions générales

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 8854 was prepared by Technical Committee ISO/TC 22, *Road vehicles.*

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Road vehicles — Alternators with regulators — Test methods and general requirements

1 Scope and field of application

This International Standard specifies test methods and general requirements for the determination of the electrical characteristic data of alternators for road vehicles.

It applies to alternators, cooled according to the manufacturer's instructions, mounted on internal combustion engines.

2 Definitions

For the purposes of this International Standard, the following definitions apply.

2.1 test voltage, U_t : Specified value, in volts, at which the current measurements shall be carried out.

2.2 cut-in frequency, n_A : Alternator rotational frequency, which is the number of revolutions divided by time, in minutes to the power minus one, at which it begins to supply current when frequency is increased for the first time. This depends on pre-exciting power (input), frequency changing velocity, battery voltage and residual flux density of the rotor.

2.3 zero-amp. frequency, n_0 : Alternator rotational frequency, in minutes to the power minus one, at which it reaches the specified test voltage U_t without any current output (the point where the current frequency characteristic $I = f(n)$ intersects the abscissa).

2.4 minimum application frequency, n_L : Alternator rotational frequency, in minutes to the power minus one, which corresponds approximately to the idling frequency of the engine. This rotational frequency is set at 1 500 min^{-1} for the purpose of this specification.

2.5 rated frequency, n_R : Alternator rotational frequency, in minutes to the power minus one, at which it supplies its rated current I_R.

The rated frequency is specified as $n_R = 6\,000\ \text{min}^{-1}$.

2.6 minimum application current, I_L : Current, in amperes, which is delivered by the alternator at test voltage U_t and at frequency $n_L = 1\,500\ \text{min}^{-1}$.

2.7 rated current, I_R : Minimum current, in amperes, which the alternator shall supply at a frequency $n_R = 6\,000\ \text{min}^{-1}$ and at test voltage U_t.

2.8 maximum current, I_{max} : Current, in amperes, which the alternator supplies at maximum continuous frequency (as defined by the alternator manufacturer) and at test voltage U_t.

3 Test conditions

The tests shall be carried out at a room temperature of 23 ± 5 °C wherever possible. A temperature deviating from this range shall be recorded.

The reference point for recording cooling air temperature shall be at 5 cm from the air intake of the alternator.

The direction of alternator rotation shall be as indicated by the manufacturer.

In the measuring circuit, a battery and an adjustable resistor R shunted to the battery are used (see figures 1 and 2).

The tests shall be conducted using a fully charged lead-acid battery of the correct nominal voltage having a nominal capacity of not less than 50 % of the rated current I_R, expressed in ampere-hours.

The overall capability of the test equipment shall allow parameter measurements within the tolerances shown in the table.

Table

Parameter	Accuracy %
Voltage	± 0,3
Current	± 0,5
Torque	± 2
Rotational frequency	± 1

All measurements of current shall be carried out by adjusting the load resistor R to maintain a constant test voltage U_t.

The measurements shall be carried out with integral or separate regulator.

To prevent the regulator working, measurements shall be made at the following test voltages :

13,5 ± 0,1 V for 12 V systems;

27 ± 0,2 V for 24 V systems.

4 Test equipment connection diagram

For alternator tests, connections shall be made in accordance with figure 1.

The voltmeter shall be connected direct to the alternator power output terminals.

The connecting cables used shall be adequate for the output of the alternator under test. In the case of a separate regulator, their lengths shall be recorded.

5 Measurement procedure

5.1 Current/rotational frequency characteristic

5.1.1 Warm tests

5.1.1.1 Rotational frequencies and measuring points

Current measurement shall be taken at the following rotational frequencies (in minutes to the power minus one); the temperature of the stator shall be allowed to reach equilibrium at each individual frequency before current values are recorded :

2 A-rotational frequency ($\approx$ 1 000) — 1 500 — 2 000 — 2 500 — 3 000 — 3 500 — 4 000 — 5 000 — 6 000 — 9 000 — 12 000 — n_{max}

The current/rotational frequency characteristic is indicated by the following five points :

a) Cut-in frequency, n_A

Increase the alternator rotational frequency until the charge indicator system indicates the commencement of battery charging, and record this frequency.

The value of charge indicator influences the cut-in frequency and its value shall be agreed between the alternator manufacturer and the vehicle manufacturer.

b) Zero-amp. frequency, n_0 (indirect measurement)

Reduce the alternator rotational frequency until an alternator output current between 5 % of I_R and 2 A, but not less than 2 A, is reached. Record frequency and current for graphic determination of the zero-amp. frequency : i.e. the zero-amp. speed is determined by extension of the current/rotational frequency characteristic until the abscissa is intersected.

This graphic extrapolation shall be made after completing the measurements.

c) Minimum application current, I_L

Adjust the alternator rotational frequency to n_L = 1 500 min^{-1}, and record the alternator output current (defined as being the minimum application current I_L).

d) Rated current, I_R

Adjust the alternator rotational frequency to n_R = 6 000 min^{-1}, and record the alternator output current (defined as being the rated current I_R).

e) Maximum current, I_{max}

Adjust the alternator rotational frequency to n_{max} as specified by the alternator manufacturer, and record the alternator output current (defined as being the maximum current I_{max}).

5.1.1.2 Characteristic of power absorbed (drive power) and efficiency

The power absorbed by the alternator shall be calculated at the measuring points shown in 5.1.1.1.

If so desired, the efficiency of the alternator may be calculated and recorded.

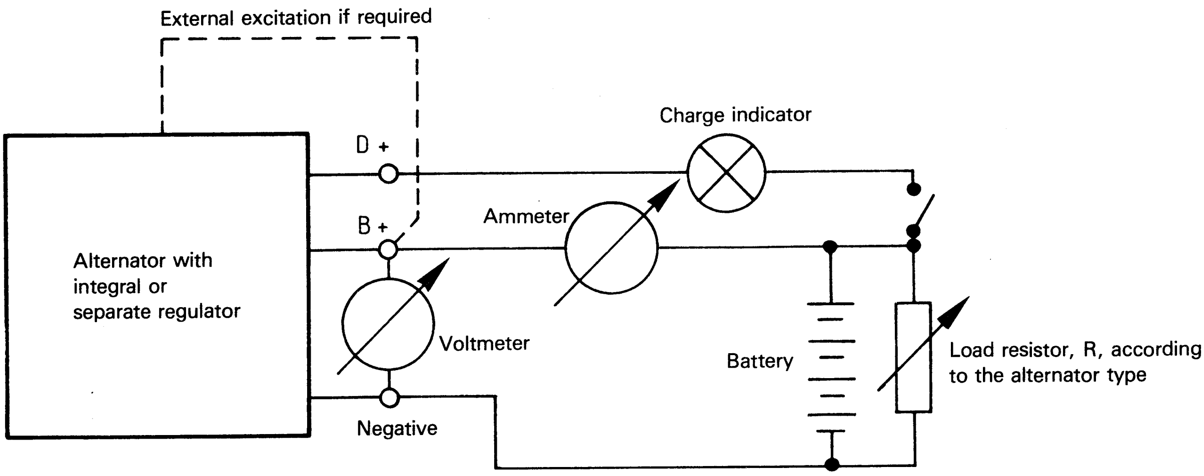


Figure 1 — Diagram for alternator testing

5.1.2 Short form tests

5.1.2.1 Short form warm test

The alternator under test shall be warmed up for 30 min at 3 000 min^{-1}. It is however permissible to reduce this time if it can be shown that the temperature which would be reached after 30 min has been attained in a shorter period. The voltage shall be constant and equal to the test voltage U_t during the warm-up and the measuring period.

After the warm-up period, the rotational frequency shall be reduced until the current is between 2 A and 0,05 I_R. Record current and rotational frequency.

Current measurements shall be taken at least at the following rotational frequency values (in minutes to the power minus one) :

1 500 — 2 000 — 3 000 — 4 000 — 6 000 — 9 000 — 12 000 — n_{max}

If so desired, further intermediate values may be recorded.

The test time shall not exceed 30 s, with constant variation of frequency.

5.1.2.2 Short form cold test

Current measurements shall be taken at least at the following rotational frequency values (in minutes to the power minus one) :

2 A-rotational frequency — 1 500 — 2 000 — 3 000 — 4 000 — 6 000 — 9 000 — 12 000 — n_{max}

If so desired, further intermediate values may be recorded.

The test time shall not exceed 30 s with constant variation of frequency.

5.2 Testing of functional ability of regulator

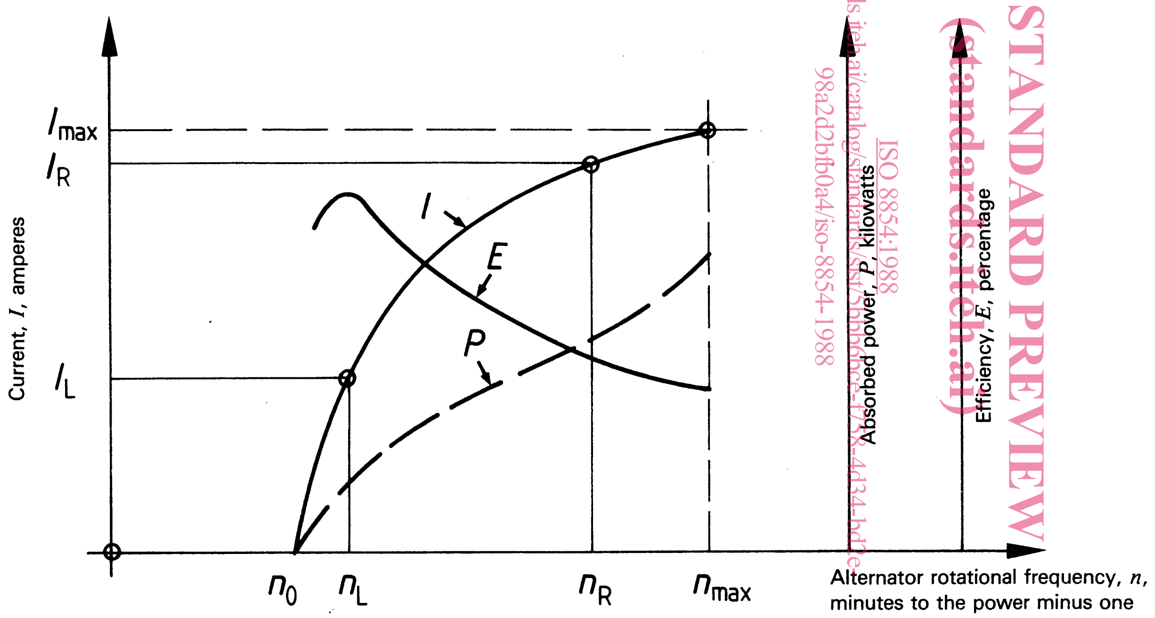
The alternator shall be run at rated rotational frequency and rated current until the temperature of the regulator becomes stable. The load shall then be reduced to 5 A and a check made to determine that the voltage does not rise above the alternator voltage specified by the alternator manufacturer.

NOTE — The setting of the regulator is specific to the vehicle manufacturer.

6 Presentation of results

Measurements of current/rotational frequency and power absorption characteristics shall be presented in accordance with figure 2.

The tests described in 5.1.1 and 5.1.2 will produce different characteristic curves and therefore different maximum current values. The manufacturer shall indicate which test method has been used.



Key

I_{max} Maximum current

I_R Rated current

I_L Minimum application current

n_{max} Maximum continuous rotational frequency as defined by the alternator manufacturer

n_R Rated rotational frequency = 6 000 min^{-1}

n_L Minimum application rotational frequency = 1 500 min^{-1}

n_0 Zero-amp. frequency

P Power absorbed by the alternator at full load (torque measurement)

E Efficiency

Figure 2 — Presentation of results

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