

INTERNATIONAL STANDARD

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Forestry machinery — Portable brush-saws — Engine performance and fuel consumption

*Machines forestières — Débroussailleuses portatives — Puissance et consommation
du moteur*



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Foreword

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International Organization for Standardization

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Forestry machinery — Portable brush-saws — Engine performance and fuel consumption

1 Scope

This International Standard specifies a method for testing the performance and fuel consumption of internal combustion engines used to power portable, hand-held, brush-saws for use primarily in forestry.

2 Apparatus

2.1 Brake power test bench with a torque accuracy of $\pm 2\%$ of the measured value.

2.2 Tachometer with an accuracy of $\pm 0,5\%$ of the measured value.

2.3 Fuel consumption measuring device with an accuracy of $\pm 3\%$ of the measured value.

2.4 Thermometer with an accuracy of $\pm 1\text{ K}$.

2.5 Barometer with an accuracy of $\pm 0,5\%$ of the measured value.

2.6 Humidity test device with an accuracy of $\pm 2\%$.

3 Test conditions

3.1 Ambient temperature, measured at a distance of 15 cm from the air intake: $15\text{ }^{\circ}\text{C}$ to $27\text{ }^{\circ}\text{C}$.

3.2 Atmospheric pressure: 97,5 kPa to 105 kPa.

3.3 Correction to reference atmospheric conditions shall be made according to the following formulae:

$$P_r = K_r P_x$$

$$M_r = K_r M_x$$

$$C_r = K_r C_x$$

$$K_r = \frac{p_r}{p_x} \left(\frac{T_x}{T_r} \right)^{0,5}$$

where

index r is the standard reference conditions;

index x is the actual measured conditions;

P is the brake power, in kilowatts;

M is the torque, in newton metres;

C is the fuel consumption, in kilograms per hour;

K_r is the reference adjustment factor;

p_r is the reference dry atmospheric pressure, in kilopascals;

p_x is the measured dry atmospheric pressure (i.e. total pressure minus the water vapour pressure), in kilopascals;

T is the ambient temperature, in kelvins.

3.4 The standard reference conditions shall be the following:

— $T_r = 298\text{ K}$ (dry bulb)

— $p_r = 99\text{ kPa}$ (based on a total barometric pressure of 100 kPa and a water vapour pressure of 1 kPa)

3.5 The values T_x and p_x shall be calculated as the average of the values resulting from the tests in 5.2.3 and 5.2.7.

3.6 The variation of T_x during the measurements shall not exceed $\pm 3\text{ K}$.

3.7 Power-consuming auxiliaries, if any, shall be turned off.

3.8 The exhaust outlet shall operate against a pressure equal to that at the air intake.

3.9 No extra cooling or air supply is allowed.

3.10 The engine shall be coupled to the power brake in such a manner that the engine crankshaft is aligned with the brake shaft and connected to it with a flexible coupling. The use of the engine clutch is optional.

3.11 The governor of the rotational frequency can sometimes be influenced by the power brake set-up. Therefore the maximum free rotational frequency of the complete saw in hand-held operation should be checked first. If this frequency cannot be reached in the power brake set-up, the governor of the rotational frequency shall be disengaged.

3.12 The fuel should consist of petrol with a minimum octane number (RON) of 90¹⁾, mixed with two-stroke oil according to the manufacturer's recommendation if it is a two-stroke engine. The fuel density shall be $740 \text{ kg/m}^3 \pm 15 \text{ kg/m}^3$.

4 Measurement conditions

4.1 Measurements shall be carried out on a new brush saw with its standard equipment.

4.2 The engine shall be complete (except shaft tube, power transmission shaft, and angle transmission) with all standard production auxiliaries for its operation (filter, silencer, cooling system, etc.).

4.3 The engine shall be run in, in accordance with the manufacturer's instructions.

5 Test method

5.1 General

With the throttle fixed in the fully open position, record the brake power, torque and fuel consumption as a function of the rotational frequency in steps of 10 s^{-1} (r/s) starting from the lowest rotational frequency. No adjustments are allowed during the test.

Take the readings during the 10 s interval between 50 s and 60 s after application of full load.

Take the readings at least over a rotational frequency range limited by the rotational frequency for maximum torque minus 15 s^{-1} and the rotational frequency for maximum power plus 15 s^{-1} .

5.2 Procedure

Carry out the measurements according to the procedure given in 5.2.1 to 5.2.7.

5.2.1 Prior to mounting the engine on the power test bench, warm up the engine and set the idle speed adjuster and low speed mixture adjuster for best idling at the speed recommended by the manufacturer.

5.2.2 Run the engine at full throttle on the power test bench at the maximum power rotational frequency specified by the manufacturer. Set the high speed mixture adjuster for maximum power within 1 min.

5.2.3 Warm up the engine with alternating rotational frequencies. Record the ambient temperature and pressure during the end of this period.

5.2.4 Run the engine at idling for 1 min.

5.2.5 Take the readings in accordance with 5.1.

5.2.6 Repeat 5.2.4 and 5.2.5 over the stated rotational frequency range up to the rotational frequency of maximum power plus 15 s^{-1} .

5.2.7 Record the ambient air temperature and pressure.

6 Test report

The test report shall include the following information.

- a) Basic information specifying:
 - 1) reference to this International Standard;
 - 2) date and place of measurement;
 - 3) names of the person requiring the test and the person carrying it out.
- b) Description of the saw including:
 - 1) manufacturer's name or make or brand name;
 - 2) model (type);
 - 3) serial number;
 - 4) working cycle (for example, two-stroke);
 - 5) bore, stroke and swept volume of the engine;
 - 6) fuel density;
 - 7) oil mixture ratio;
 - 8) petrol octane number (RON);
 - 9) measuring equipment;
 - 10) ambient air temperature;
 - 11) ambient air pressure.
- c) The following parameters shall be given as a function of the engine rotational frequency (see examples in figure 1):
 - 1) power in kilowatts;
 - 2) torque in newton metres;
 - 3) fuel consumption in kilograms per hour;
 - 4) specific fuel consumption in grams per kilowatt hour.

1) If the fuel does not comply with the specifications given in this clause, full details should be given in the test report.

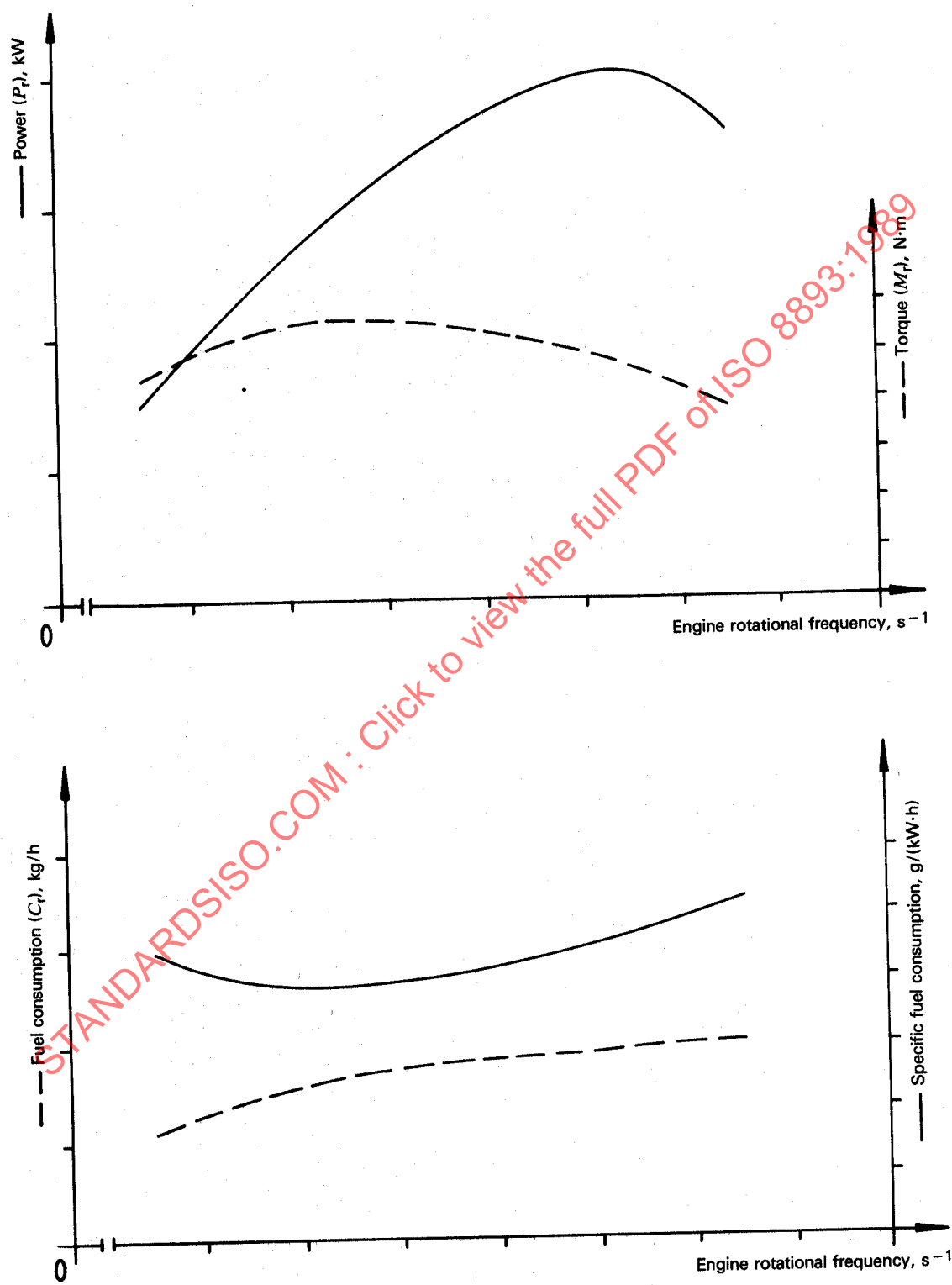


Figure 1 — Examples of characteristic curves

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