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Road vehicles — Engine power test code

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International, Trade and Industry, through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law:

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Road vehicles—Engine power test code

1 Scope This Japanese Industrial Standard specifies test methods for gross shaft output and net shaft output of spark ignition engines and diesel engines for automobiles, under full load conditions.

This Standard is not applicable to engines designed for two-wheeled vehicles and agricultural tractors.

NOTES 1 The normative references to this Standard are as follows:

JIS K 2202 *Motor gasoline*

JIS K 2204 *Diesel fuel*

JIS Z 8806 *Humidity—Measurement methods*

2 International Standards corresponding to this Standard are as follows:

ISO 1585 *Road vehicles—Engine test code—Net power*

ISO 2534 *Road vehicles—Engine test code—Gross power*

2 Definition of terms For the purpose of this Standard, the following terms and definitions apply.

- (1) gross shaft output shaft output measured while the engine is equipped with only those auxiliary items required for engine operation (auxiliary equipment mounting condition A shown in table 1) and is loaded on the test bed
- (2) net shaft output shaft output measured while the engine is equipped with all auxiliary items required for specific applications (auxiliary equipment mounting condition B shown in table 1)

3 Test conditions Conditions for engines, fuels, lubricating oils and measuring instruments used for the test shall be as follows:

- (1) The engine shall be subjected to recommended break-in operation prior to testing.
- (2) The auxiliary equipment shown in table 1 shall be mounted to resemble actual conditions as close as possible appropriate to the gross shaft output test or the net shaft output test.
 - (a) Auxiliary equipment normally mounted to the engine and required only for vehicle operation shall be removed during the test. When removal of such equipment is not possible, the power to be absorbed by this equipment under no load

condition may be determined and then added to the shaft output under the standard condition specified in 6.2.

- (b) The change gear shall not be provided. However, the change gear may be provided in cases where it is essential to operation or where direct coupling of the engine with the dynamometer is difficult, as in the case of high-speed engines.
- (3) To attain full load condition of the engine, the throttle valve shall be fully opened for spark ignition engines and the fuel injection pump shall be set to the prescribed full load condition for diesel engines.
- (4) For liquid-cooled engines, the coolant temperature shall be controlled to $80 \pm 5^{\circ}\text{C}$ at engine outlet except in cases where another temperature is specified. To attain the specified temperature, an auxiliary temperature regulating device may be used when necessary.
- (5) In cases where an air-cooled engine is tested under standard atmospheric conditions, the temperature at any specific point shall not be lowered by more than 20°C from the maximum set temperature. To attain the specified temperature, an auxiliary temperature regulating device may be used when necessary.
- (6) In order to reduce the need for output correction, the intake air temperature should be set to the standard atmospheric temperature specified in 6.3.

Table 1 Auxiliary equipment mounting conditions

Auxiliary equipment	Mounting condition A (Gross shaft output)	Mounting condition B (Net shaft output)
Intake system		
Suction manifold	○	○
Blow-by gas reduction device	—	○
Air cleaner ⁽²⁾	—	○
Intake silencer	—	○
Speed limiting device	×	○
Suction manifold heating device	○	○
Exhaust system		
Exhaust manifold	○	○
Connection pipe	△	○
Exhaust silencer	△	○
Tail pipe	△	○
Exhaust brake ⁽⁴⁾	×	○
Fuel supply system ⁽⁵⁾	○	○
Carburettor	○	○
Electronic control device, air flow meter, etc.	—	○
Pressure reducing device ⁽⁶⁾	○	○
Evaporator ⁽⁶⁾	○	○
Mixer ⁽⁶⁾	○	○
Fuel injection system		
Pre-filter	△	○
Filter	△	○
Pump	○	○
High-pressure pipe	○	○
Injection nozzle	○	○
Cooling system (Liquid cooling type)		(7)
Radiator	×	○ ^{(8), (9)}
Fan	×	○ ^{(10), (11)}
Fan cowl	×	○
Circulating pump	○	○
Thermostat ⁽¹²⁾	○	○
(Air cooling type)		
Baffles	○	○
Fan ⁽¹¹⁾	○	○
Temperature regulating device	×	○
Lubricating oil cooler	○ ⁽¹³⁾	○
Electric system ⁽¹⁴⁾	○	○
Supercharging system		
Supercharger	○	○
Charge cooler ⁽¹⁵⁾	○	○
Coolant pump or fan ⁽¹⁶⁾	○	○
Coolant flow regulating device	×	○
Pollution control system ⁽¹⁷⁾	○ ⁽¹⁸⁾	○

Notes (1) The intake system used during actual use shall be applied for two-cycle and spark ignition engines, for cases where engine output may be significantly affected, or whenever required by the manufacturer.

For other cases, an equivalent intake system may be used after it is confirmed that the suction pressure is not altered by more than 100 Pa of the value set for the case where a clean air filter is mounted.

(2) When the air cleaner is equipped with a suction pre-heater, the heater shall be blocked during the test.

(3) The exhaust system used during actual use shall be applied for two-cycle and spark ignition engines, for cases where engine output may be significantly affected, or whenever required by the manufacturer. However, when test bed conditions preclude actual mounted conditions the connection may be altered, providing output is not affected. For other cases, an equivalent exhaust system may be used after it is confirmed that the exhaust pressure measured at a point 0.15 m downstream from the exhaust manifold is not altered by more than 1 kPa of the set value.

(4) When the exhaust brake is incorporated to the engine, the test shall be carried out with the throttle valve fixed to the full open position.

(5) When reproduction of the fuel supply pressure is required for specific applications, the fuel supply pressure may be adjusted.

(6) Auxiliary equipment for engines based on gaseous fuel

(7) Under mounting condition B, the cooling system shall be arranged as close as possible to mounted conditions, and the coolant shall be circulated by the engine circulating pump only.

(8) Cooling may be accomplished by use of a radiator (auxiliary equipment) or an external circuit. In cases where an external circuit is used for cooling, pressure loss and circulating pump inlet pressure shall be practically equivalent to those developed by the auxiliary equipment.

(9) The radiator shutter, when provided, shall be fixed to the full open position during the test.

(10) In the event that the radiator, fan and fan cowl are not properly mounted to the engine, power consumed by a fan properly mounted at the correct location (separate from the engine), relative to the radiator and the fan cowl, shall be determined by actual measurement or calculation at the rotational speed corresponding to the engine rotational speed and then this value shall be subtracted from the engine shaft output under the standard condition specified in 6.2.

(11) When the fan design permits, the fan shall be disconnected from the power supply beforehand. When design factors allow possible slippage under normal conditions, the test shall be carried out with maximum slippage.

(12) The thermostat may be fixed to the full open position.

(13) Under condition A, this device need not be mounted when it is not built into the engine.

(14) Generator output shall be tested with the minimum output required for engine operation. When a battery connection is required, a battery in good charged condition shall be used.

(15) A test facility heat exchanger with equivalent pressure drop and temperature drop may be used for air cooled type charge coolers.

(16) The coolant pump or fan shall be driven by the engine.

(17) This category includes; EGR device, catalyst converter, thermal reactor, secondary air supply device and fuel evaporation prevention device.

(18) Under condition A, this device need not be mounted when it is not built into the engine.

NOTE : In this table, the ○ symbol denotes that the auxiliary equipment concerned is provided, the × symbol denotes not provided, the — symbol denotes arbitrary installation, and the △ symbol denotes any device other than auxiliary equipment may be used.

(7) The fuel used in the test shall be as follows:

- (a) Gasoline; motor gasoline specified in JIS K 2202 shall be used. When the fuel contains a mixture of lubricating oil, the lubricating oil recommended for the engine shall be used.
 - (b) Diesel fuel; No. 2 diesel oil specified in JIS K 2204 shall be used.
 - (c) Other fuels; standards governing the fuel concerned or its principal properties shall be recorded.
 - (d) Fuel temperature at the carburetor inlet or fuel injection pump inlet shall be maintained in the range recommended for the engine. To attain this, an auxiliary temperature regulating device may be used when required.
- (8) Lubricating oil viscosity and temperature shall be at the levels recommended for the engine. An auxiliary temperature regulating device may be used if necessary.

4 Accuracy of measuring equipment Accuracy of the measuring equipment shall be as follows:

- (1) Dynamometer accuracy shall be $\pm 1\%$ of the maximum shaft torque measured. However, when $1/2$ or less of the dynamometer measuring range is applied, accuracy may be $\pm 2\%$ of the maximum shaft torque measured.
- (2) Engine rotational speed measuring equipment accuracy shall be $\pm 0.5\%$ of the measured maximum rotational speed.
- (3) Fuel consumption meter accuracy shall be $\pm 1\%$ of the measured maximum fuel consumption.
- (4) Thermometer accuracy shall be $\pm 2\text{ }^{\circ}\text{C}$. However, this shall be $\pm 1\text{ }^{\circ}\text{C}$ for intake air temperature measurement.
- (5) Barometer accuracy shall be $\pm 100\text{ Pa}$.
- (6) Exhaust pressure measuring equipment accuracy shall be $\pm 200\text{ Pa}$.
- (7) Suction pressure measuring equipment accuracy shall be $\pm 50\text{ Pa}$.

5 Measuring method

5.1 Measurement items Common measurement items in this test are as follows:

Individual measurement items may be omitted depending on the engine type or test requirements.

- (1) **Shaft torque** Breaking load of the dynamometer or shaft torque shall be read out. In cases where the change gear is mounted, rotational speed of the dynamometer shall be measured simultaneously.
- (2) **Engine rotational speed** Rotational speed of the crankshaft shall be read out.