

SURFACE VEHICLE STANDARD

SAE J1312

REV.
JAN90

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Submitted for recognition as an American National Standard

(R) PROCEDURE FOR MAPPING ENGINE PERFORMANCE SPARK IGNITION AND COMPRESSION IGNITION ENGINES

1. SCOPE:

The purpose of this SAE code is to provide a standardized test procedure for generating engine performance maps. An engine performance map is a listing of engine fuel flow rates versus torque or power obtained at specific engine speeds and loads. Engine performance maps as specified by this code can be used in fuel economy simulation programs.

This document is applicable to both four-stroke spark ignition (SI) and compression ignition (CI) engines, naturally aspirated and pressure charged, with or without charge air cooling.

2. REFERENCE:

SAE J1349 JAN90, Engine Power Test Code - Spark Ignition and Compression Ignition - Net Power Rating

SAE J1349 is the sole reference document for this document. All engine test procedures, including engine and test equipment, correction procedures, instrumentation, reference conditions, terminology, etc., shall be in accordance with SAE J1349 except where otherwise specified by this document.

3. ENGINE EQUIPMENT:

A "fully equipped" engine is used for this test, in accordance with SAE J1349, Sections 4.4 and 6. Please refer to SAE J1349 for specific equipment details.

4. POWER CORRECTIONS:

Measured engine torque or power levels and fuel flow rates must be corrected to standard reference air and fuel supply test conditions. The corrections are made in accordance with SAE J1349, Sections 5 and 9 with the following exceptions:

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- 4.1 For CI engines, the correction procedure shall be used for both full and part load operation.
- 4.2 Since no adequate part load correction procedure is documented for SI engines, no corrections shall be made to the measured data. Therefore, inlet air must be controlled to reference test conditions.

5. TEST PROCEDURES:

The test data for performance maps must be generated at specific engine speeds and loads. All other test procedures are conducted in accordance with SAE J1349, Section 7.

- 5.1 Test data must be obtained at each of the following speeds:
 - a. Rated or maximum speed
 - b. Peak torque speed
 - c. Idle speed
 - d. Intermediate speeds
 - e. Optional speeds.
- 5.1.1 Rated (or maximum), peak torque and idle speeds are defined by the manufacturer.
- 5.1.2 Intermediate speeds should be obtained at equal 10% increments of rated (or maximum) speed, (for example, 90% of rated, 80% of rated, etc.). Intermediate speeds may be rounded to the nearest 100 rpm. Intermediate speeds falling within 100 rpm of any other required test speeds may be omitted.
- 5.1.3 Optional speeds are any additional speeds deemed by the manufacturer as necessary to adequately define the shape of the power curve or to simulate vehicle operational requirements.
- 5.2 At each test speed, the engine shall be run at no less than five loads, one of which shall be full load. Specific test load levels shall be determined by the engine manufacturer, based on the engine's intended service operating characteristics. This may include motoring (negative) load levels. If intended service operating characteristics are not known, the engine shall be run at equally spaced load intervals (example: 0%, 25%, 50%, 75%, 100%).
 - 5.2.1 Data acquisition at certain speeds and loads may be subject to the capabilities of the test dynamometer. In such cases, these test points may be omitted from the map, at the manufacturer's discretion, if it can be shown that vehicle operational requirements do not utilize these data.
- 5.3 If engine performance is affected by vehicle related hardware, it may be necessary to generate additional maps to simulate specific operating conditions. Examples include individual vehicle restriction effects, or engine control devices based on torque converter position, gear ratio, vehicle speed, etc. When additional maps are run, each shall be clearly labeled with applicable test conditions or hardware.

6. PRESENTATION OF RESULTS:

- 6.1 Data shall be recorded for test documentation in accordance with SAE J1349, Section 8. Additional data may be recorded at the manufacturer's discretion.
- 6.2 Engine data obtained and required specifically for the performance map shall be tabulated in a format acceptable for use by the vehicle simulation program. The following sample format may be used:

<u>Engine Speed</u>		<u>% Load</u>	<u>Reference Condition Torque or Power</u>	<u>Reference Fuel Flow Rate</u>
Rated:	X	Highest	X	X
		↓	↓	↓
		Lowest	X	X
1st Intermediate	X	Highest	X	X
		↓	↓	↓
		Lowest	X	X
2nd Intermediate:	X	etc.	etc.	etc.
etc.				

The (R) is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. If the symbol is next to the report title, it indicates a complete revision of the report.

RATIONALE:

Not applicable.

RELATIONSHIP OF SAE STANDARD TO ISO STANDARD:

Not applicable.

REFERENCE SECTION:

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APPLICATION:

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