SAE International™

SURFACE VEHICLE STANDARD

SAE J2723

ISSUED APR2005

Issued 2005-04

Engine Power Test Code—Engine Power and Torque Certification

SAENORM.COM : Click to view the full PDF of j2723_200504

1. Scope

This document specifies the procedure to be used for a manufacturer to certify the net power and torque rating of a production engine according to SAE J1349 (Rev. 8/04) or the gross engine power of a production engine according to SAE J1995.

Manufacturers who advertise their engine power and torque ratings as Certified to SAE J1349 or SAE J1995 shall follow this procedure. Certification of engine power and torque to SAE J1349 or SAE J1995 is voluntary, however, this power certification process is mandatory for those advertising power ratings as "Certified to SAE J1349".

1.1 Rationale

Power and torque certification provide a means for a manufacturer to assure a customer that the engine they purchase delivers the advertised performance.

1.2 Purpose of Standard

This SAE Standard has been written to provide manufacturers with a method of certifying the power of engines to SAE J1349 or SAE J1995.

1.3 Field of Application

This certification process is applicable to all engines tested under SAE J1349 or SAE J1995.

2. Applicable Publications

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply.

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be reaffirmed, revised, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2005 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: custsvc@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

SAE 100 Leading Our World In Motion

2.1 SAE Publications

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or at www.SAE.org.

SAE J1349—Engine Power Test Code—SI and CI—Net Power Rating
SAE J1995—Engine Power Test Code—SI and CI—Gross Power Rating

3. Terms and Definitions

This section contains the definitions of key terms used to describe the net power and torque test.

3.1 Certified Brake Power and Torque

The power and torque which a manufacturer certifies an engine will develop when tested under the conditions as specified in SAE J1349 or SAE J1995.

4. Selection, Documentation, and Verification of Test Article

The engine to be tested shall be selected by the manufacturer as representative of the engine in the application being certified. It is preferable to test engines from regular series production. Engines built from production-intent parts with production-intent processes and tooling may be used in the testing provided that all components conform to production intent design and comply with the requirements of the applicable standard (SAE J1349 or SAE J1995). It is the intent of this process that the level of hardware and calibration compliance to production specifications will be that which is required for U.S. EPA Emissions Certification.

5. Witness Testing

5.1 Definition

Witness testing is defined to mean testing in an appropriate facility that is witnessed by a qualified witness, independent of the engine manufacturer, who is able to verify equipment function and calibrations, computations, and engine test settings as specified in the applicable standard. Testing for conformance to this standard may be done in the manufacturer's facility or in any qualified independent facility conforming to ISO 9000/9002. Qualification is established by the ability to meet the requirements for testing according to SAE J1349 or SAE J1995.

5.2 Qualifications of Witness

Witnesses for engine power and torque certification testing shall be registered with SAE. Witnesses shall be competent engineers who are experienced in engine testing and familiar with the requirements of the SAE J1349 and SAE J1995 standards.

Witnesses registered by SAE shall meet one of the following criteria:

SAENORM.COM : Click to view the full PDF of j2723_200504

5.2.1 Prior registration as a witness for European homologation testing and a signed statement acknowledging that the individual has studied and understands the SAE procedures.

5.2.2 Documented and verified experience in engine testing with three recommendations from individuals who are registered witnesses themselves or whose technical training and experience establish them as competent to evaluate the individual's skills as a witness. In addition, a signed statement is required acknowledging that the individual to be registered has studied and understands the SAE J1349 and SAE J1995 testing procedures.

5.2.3 A Bachelors Degree in Engineering or equivalent plus 5 years of related engine testing experience and completion of an SAE-approved training course. Documented participation as an "apprentice witness" in at least three (3) SAE J1349 or SAE J1995 test procedures conducted by an SAE-certified witness who attests to the competency of that individual to conduct witness tests may be substituted for completion of an SAE-approved training course.

5.2.4 Other qualified individuals who are identified and appointed by the SAE Engine Power Test Code Committee. The witness will provide a signed statement acknowledging that the individual has studied and understands the relevant SAE test procedures.

5.3 Responsibility of Witness

5.3.1 Confirm that the laboratory doing the testing is capable of meeting the requirements for SAE J1349 or SAE J1995 and that the calibration of measurement devices is in accordance with ISO 9000/9002. Verify that management of the laboratory doing the testing has and can present a valid certificate of compliance to ISO 9000/9002. The witness shall attach a copy of this certificate to the test results.

5.3.2 Verify that the engine tested is consistent with that described in the manufacturer's submission.

5.3.3 Verify that the engine induction and exhaust system are those for the application being evaluated or, if applicable, verify that the exhaust backpressure is set appropriately.

5.3.4 If applicable, review data on vehicle transient testing to ensure that engine settings for dynamometer testing are correct. The data required for this shall include identification of the vehicle from which test data were obtained and the transient test data determined using the procedure in SAE J1349. These data shall include: engine control settings, temperatures, intake manifold pressure and exhaust back pressure as functions of time and vehicle speed.

5.3.5 Verify that fuel, coolant and lubricants used in testing are consistent with the manufacturer's specification for the application being rated.

5.3.6 The witness shall verify by appropriate means that critical measurements required for engine power and torque measurement are accurate. This may include testing of instrumentation.

5.3.7 Verify calculations by checking the output of the calculations with a test data set and by processing raw data from a test condition independently.

5.3.8 Verify that all control settings and test cell conditions are within the tolerance specified by the applicable standard.

SAENORM.COM : Click to view the full PDF of j2723_200504

5.3.9 Verify that the instrumentation is appropriately installed and that the signals from the instrumentation are accurately recorded and entered into the calculations.

5.3.10 Witness completion of the SAE J1349 or SAE J1995 Engine Power and Torque test procedure.

6. Manufacturer's Responsibilities for Certification

A manufacturer wishing to certify an engine shall provide the following:

6.1 Test Article

The manufacturer shall provide an engine that is representative of the production engines being certified.

6.2 Manufacturer's Statement

The manufacturer shall supply documentation to SAE that includes the information listed in the following sections.

6.2.1 Engine Description

- All measurements and descriptions as listed in the appropriate standard
- Induction and exhaust system part name and part number list.
- Listing of oil, fuel and coolant used with appropriate specifications.
- Completed Form J2723 A. Engine Content Description
- ECU part number with software and calibration identifier/version.
- Engine build phase

6.2.2 Declaration of Power and Torque

The manufacturer shall report the declared power, declared torque and the respective speeds at which those values are achieved. The power and torque shall be designated as net (SAE J1349) or gross (SAE J1995). The declared values are those values that the manufacturer can use as "SAE Certified" in their product advertising and sales literature. The measured values of torque and power must be within 1% of the declared values to be certified.

6.2.3 Test results as documented in SAE J1349 or SAE J1995.

6.2.4 Certification Statement

The manufacturer shall complete and submit form SAE J2723 B as the actual certification document.

SAENORM.COM : Click to view the full PDF of j2723_200504

7. SAE Responsibility

7.1 Review of Certification Data

SAE shall do the following prior to adding an engine to its listing of Certified Power and Torque:

1. Review all documentation to establish:
   a. The engine description documentation is complete.
   b. The witness for engine testing was an SAE-qualified witness.
   c. The test data submitted are complete as required by SAE J1349 or SAE J1995.
   d. The manufacturer has completed and an authorized representative has signed the certification statement.

7.2 Maintaining of Data Repository

SAE shall maintain a database of the certification data submitted by the manufacturers.

8. Optional Method for Manufacturers to Certify Engines for Applications with Varying Backpressure and Induction Restriction

A manufacturer may elect to test only one engine in order to certify multiple power ratings of a base engine configuration where the only differences among the ratings result from changes in restriction of the induction system ahead of the throttle and/or exhaust restriction after the exhaust manifold. The architecture of the induction and exhaust systems and manifolds of the different applications must be sufficiently similar that there are not any tuning differences among them. Use of this procedure requires that the engine calibration provide equivalent combustion timing and fueling for applications rated. Equivalence for combustion timing and fueling is to be interpreted as allowing slight alterations due to the intake and exhaust restrictions but not allowing changes in air-fuel ratio or combustion timing which would degrade power beyond the effects of the intake and exhaust restrictions.

When it is desired to certify an engine with multiple ratings, the manufacturer shall provide a chart similar to Figure 1 showing the power of the engine as a function of intake restriction and exhaust back pressure. The “base value” for this chart shall be defined by the intake and exhaust restriction values determined using procedure SAE J1349. The witness shall verify the power determined for the “base value” and may require additional test points to verify the accuracy of the chart.

Charts such as Figure 1 are generally not appropriate for engine torque. When it is desired to certify an engine with multiple torque ratings, a manufacturer may submit a list of engine configurations with torque ratings for each configuration that may then be checked by the witness as desired. A manufacturer may also elect to provide tabular power data for rating each application in lieu of a chart. The witness may elect to validate any of those data.

The rationale for allowing the certification of multiple applications through a limited number of tests lies in the concept that the manufacturer is certifying the product, and the role of SAE is to serve as the registrar and to confirm that testing of a representative engine was conducted according to SAE procedures.

SAENORM.COM : Click to view the full PDF of j2723_200504

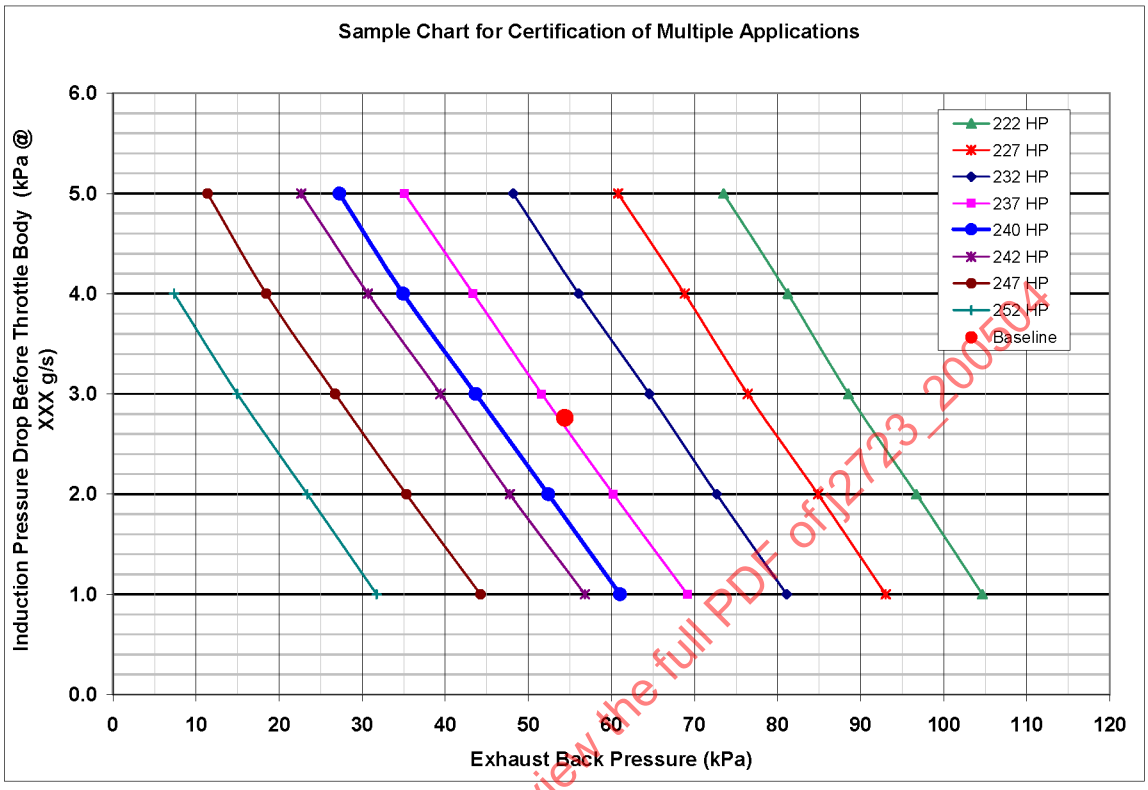

FIGURE 1

SAENORM.COM : Click to view the full PDF of j2723_200504

SAE Power Certification
Form J2723 A

ENGINE DESCRIPTION
SAMPLE (As Tested):

Displacement:	3700 cc
Configuration/Number of Cylinders:	60° V-6
Valve Train:	SOHC
Type:	Gasoline
Combustion Cycle:	Four Stroke
Pressure Charging:	Naturally Aspirated
Charge Air Cooling:	None
Bore:	93 mm
Stroke:	90.8 mm
Cylinder Numbering Convention	From front of crank nose rearward
Firing Order:	1-6-5-4-3-2 (120° Even Fire)
Compression Ratio:	9.7:1
Fuel System:	Port Fuel Injection
Fuel System Pressure	400 kPa (Nominal)
Ignition System:	Electronic Spark Ignited Coil on Plug
Knock Control:	Dual Wide-Band Knock Sensors
Intake Manifold:	Passive plastic shell molding
Exhaust Manifolds:	Cast Iron - Log Style
Cooling System:	Forced flow liquid cooling
Coolant Liquid:	50% water and 50% HOAT ethylene glycol (by volume)
Thermostat:	Inlet side – blocked open
Cooling Fan	Electric Motor Driven
Lubricating Oil:	SAE 5w30
Fuel:	Regular (87 PON)
Fuel Shut Off Speed:	6000 RPM

SAENORM.COM : Click to view the full PDF of j2723_200504

SAE Power Certification

Form J2723 B

MANUFACTURER: _____

ENGINE: _____

MODEL YEAR & VEHICLE APPLICATION: _____

TEST STANDARD: _____

TEST LOCATION: _____

ENGINE SERIAL NUMBER: _____

TEST/RUN NUMBER: _____

RESULTS:

The engine described herein was tested on _____ according to the requirements prescribed in _____, Engine Power Test Code in the presence of a qualified SAE witness, and was determined to produce the following results:

Parameter	Rated Speed	Rated Output	Measured Speed	Measured Output	% Difference
Power (hp)					
Torque (lb-ft)					

_____

SAE Certified Witness, Date

SAENORM.COM : Click to view the full PDF of j2723_200504

APPROVALS:

The manufacture declares that the engine tested for this report is representative of engines in series production. The manufacturer further declares that the performance of engines in series production will characteristically fall within 2% of the rated torque and power values indicated on this report.

_____

Name *Title* *Date*