# INTERNATIONAL STANDARD

Second edition 2016-12-01

## Internal combustion engines — Determination and method for the measurement of engine power — General requirements

Moteurs à combustion interne — Détermination et méthode de mesure de la puissance du moteur — Exigences générales **iTeh STANDARD PREVIEW** 

## (standards.iteh.ai)

<u>ISO 15550:2016</u> https://standards.iteh.ai/catalog/standards/sist/39910275-ad26-4630-8a62-47d6b25b8453/iso-15550-2016



Reference number ISO 15550:2016(E)

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see <a href="https://www.iso.org/directives">www.iso.org/directives</a>).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see <a href="https://www.iso.org/patents">www.iso.org/patents</a>).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ASO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 70, Internal combustion engines.

This second edition cancels and replaces the first edition (ISO 15550:2002), of which it constitutes a minor revision. https://standards.iteh.ai/catalog/standards/sist/39910275-ad26-4630-8a62-47d6b25b8453/iso-15550-2016

## Introduction

This document establishes the framework for ISO engine power measurement standards. By applying this framework, the disadvantages of the existence of many similar, but different, ISO standards for the definition and determination of engine power can be avoided.

This framework uses the "Core" and "Satellite" approach. The "Core" standard contains the requirements that are common to all engine applications described in the scope and the "Satellite" standard contains those requirements that are necessary to tailor power measurement and declaration to suit a particular engine application.

This document is only applicable in conjunction with a particular "Satellite" standard in order to completely specify the requirements for the particular engine application. The "Core" standard, therefore, is not a document that can stand alone, but only represents addenda to a particular "Satellite" standard used to create a complete standard together with the said "Satellite" standard.

The advantage of this approach is that the use of standards for the same or similar engines used in different applications will be rationalized and the harmonization of standards in the course of revision or development will be ensured.

This document is the "Core" standard.

This document was prepared in order to serve as the "Core" standard for making engine power measurements. It was drafted in close co-operation with technical committees ISO/TC 22 *Road vehicles*, ISO/TC 23 *Machinery for forestry and agriculture*, ISO/TC 127, *Earth moving machinery* and ISO/TC 188 *Small craft*. The prerequisite for any future modification of this document will be the formal approval of all the above technical committees. Together with the "Satellite" standard for each engine application, the "Core" standard serves as the basis for engine power declaration and measurement. Each technical committee is fully responsible for the administration of its own "Satellite" standard(s).

Any further requirements are subject to agreement between the manufacturer and customer. 47d6b25b8453/iso-15550-2016

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## Internal combustion engines — Determination and method for the measurement of engine power — General requirements

### 1 Scope

**1.1** This document specifies standard reference conditions and methods of declaring the power, fuel consumption, lubricating oil consumption and test methods for internal combustion engines in commercial production using liquid or gaseous fuels. It is applicable to the following:

- a) reciprocating internal combustion (RIC) engines (spark-ignition or compression-ignition engines) but excluding free piston engines;
- b) rotary piston engines.

These engines can be naturally aspirated or pressure-charged either using a mechanical pressure-charger or turbocharger.

- **1.2** This document is applicable to engines used for the following:
- a) land, rail-traction and marine use as defined in ISO 3046-1;
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- b) the propulsion of automotive vehicles as defined in ISO 1585 and ISO 2534;
- c) motorcycles as defined in ISO 4106; ISO 15550:2016 https://standards.iteh.ai/catalog/standards/sist/39910275-ad26-4630-8a62-
- d) the propulsion of agricultural tractors and machines<sup>2016</sup>
- e) the propulsion of earth-moving machinery as defined in ISO 9249;
- f) the propulsion of recreational craft or other small marine craft up to 24 m hull length as defined in ISO 8665.

This document can be applied to engines used to propel road construction machines, industrial trucks and for other applications where no suitable International Standard for these engines exists.

It also can be applied to tests performed both on a test bed at a manufacturer's works as well as on site.

#### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 2710-1, Reciprocating internal combustion engines — Vocabulary — Part 1: Terms for engine design and operation

ISO 3046-4, Reciprocating internal combustion engines — Performance — Part 4: Speed governing

ISO 3046-5, Reciprocating internal combustion engines — Performance — Part 5: Torsional vibrations

ISO 3046-6, Reciprocating internal combustion engines — Performance — Part 6: Overspeed protection

ISO 3104, Petroleum products — Transparent and opaque liquids — Determination of kinematic viscosity and calculation of dynamic viscosity

### ISO 15550:2016(E)

ISO 3675, Crude petroleum and liquid petroleum products — Laboratory determination of density — Hydrometer method

ISO 5163, Petroleum products — Determination of knock characteristics of motor and aviation fuels — Motor method

ISO 5164, Petroleum products — Determination of knock characteristics of motor fuels — Research method

ISO 5165, Petroleum products — Determination of the ignition quality of diesel fuels — Cetane engine method

ISO 11614, Reciprocating internal combustion compression-ignition engines — Apparatus for measurement of the opacity and for determination of the light absorption coefficient of exhaust gas

ASTM D 240, Standard Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter

ASTM D 3338/D 3338M, Standard Test Method for Estimation of Net Heat of Combustion of Aviation Fuels

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 2710-1, ISO 3046-4, ISO 7876-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/ REVIEW
- ISO Online browsing platform: available at <a href="http://www.iso.org/obp">http://www.iso.org/obp</a>

#### 3.1 Auxiliaries and equipment

<u>ISO 15550:2016</u>

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#### dependant auxiliary

item of equipment, the presence or absence of which affects the final shaft power output of the engine

#### 3.1.2

3.1.1

independent auxiliary

item of equipment that uses power supplied from a source other than the engine

#### 3.1.3

#### essential auxiliary

item of equipment that is essential for the continued or repeated operation of the engine

#### 3.1.4

#### non-essential auxiliary

item of equipment that is not essential for the continued or repeated operation of the engine

#### 3.1.5

#### standard production equipment

#### SPE

equipment specified by the manufacturer for a particular engine application that is fitted as standard to the engine

#### 3.2 Engine

#### 3.2.1

#### engine adjustment

physical procedure of modifying an engine for the purpose of adapting it to deliver a power adjusted to a different set of ambient conditions, such as by moving the limiting fuel stop, re-matching the turbocharger, changing the fuel injection timing or other physical changes

Note 1 to entry: Once the modifications have been completed, the engine is an adjusted engine.

#### 3.2.2

#### non-adjusted engine

engine which is pre-set so that no physical procedure of modifying the engine for the purpose of adapting it to a different set of ambient conditions is carried out

#### 3.2.3

#### engine speed

number of revolutions of the crankshaft in a given period of time

[SOURCE: ISO 2710-1:2000, 11.1]

#### 3.2.4

#### declared engine speed

engine speed corresponding to the *declared power* (3.3.1)

[SOURCE: ISO 2710-1:2000, 11.1.2 modified] RD PREVIEW

Note 1 to entry: In some applications, the declared engine speed is named "rated speed".

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#### 3.2.5

#### declared intermediate engine speed

engine speed less than 100 % of the declared speed, declared by the manufacturer taking into account the specific requirement defined in the relevant "Satellite" standard

#### 3.2.6 low idle engine speed idling speed

lowest steady-state engine speed without load

[SOURCE: ISO 2710-1:2000, 11.1.4 — modified]

#### 3.2.7

#### engine speed at maximum torque

engine speed at maximum torque on maximum fuel stop, including additional torque fuel setting, if applicable

[SOURCE: ISO 3046-4:2009, 2.3.13 — modified]

#### 3.3 Power and load

#### 3.3.1

#### declared power

value of the power, declared by the manufacturer, which an engine will deliver under a given set of circumstances

Note 1 to entry: In some applications, the declared power is named "rated power".

#### 3.3.1.1

#### declared propeller shaft power

value of the power, declared by the manufacturer, at the propeller shaft of an engine sold with complete propulsion units or at the coupling to the propeller shaft of an engine sold with reduction and/or reversing gears

#### 3.3.1.2

#### declared crankshaft power

value of the power, declared by the manufacturer, at the engine power output shaft of an engine sold without reduction or reversing gears, stern drives or sail drive units

#### 3.3.2

#### indicated power

total power developed in the working cylinders as a result of the pressure of the working medium acting on the pistons

[SOURCE: ISO 2710-1:2000, 13.1]

#### 3.3.3

#### brake power

power or the sum of the powers delivered at the end of the crankshaft or its equivalent, with the equipment and auxiliaries fitted as required by the relevant "Satellite" standard

Note 1 to entry: See <u>Table 1</u>.

#### 1 2 3 4 5 No. Equipment and auxiliaries Fitted for Fitted for Fitted for engine net engine gross engine power test in power test in power test iTeh STANDA accordance with accordance with in accordance ISO 1585 ISO 2534 with ISO 14396 (standards.iso3665ai) ISO 9249 ISO 4106 Inlet system: Inlet manifold 1 Yes, if SPE-Yes if SPE Yes, if SPE Crankcase emission control system3 Optional Yes, if SPE so- Yess (if SPE) Yes, if SPE Control devices for dual induction Yes, if SPE Yes, if SPE Inlet manifold system: Air flow meter Yes, if SPE Yes, if SPE Yes, if SPE Air inlet ductwork Yes, if SPEa **Optional**<sup>a</sup> Yesa Air filter **Optional**<sup>a</sup> Yes, if SPEa Yesa Inlet silencer Yes, if SPEa **Optional**<sup>a</sup> Yesa Yesa Speed-limiting device Yes, if SPEa No Induction-heating device of inlet manifold Yes, if SPE. If possible, to be set in the most 2 favourable condition. 3 Yes, if SPE Exhaust system: Exhaust purifier Yes. if SPE Yes, if SPE Yes, if SPE Yes, if SPE Exhaust manifold Yes, if SPE Pressure-charging device Yes, if SPE Yes, if SPE Yes, if SPE Yes, if SPE<sup>b</sup> Yesb **Connecting pipes** Optional, may use minimum Silencer Yes, if SPE<sup>b</sup> Yesb loss test bed Tail pipe Yes, if SPEb Yesb systemb Exhaust brake Yes, if SPE<sup>c</sup> Noc Noc Fuel supply pump Yes. if SPEd Yes. if SPEd Yes. if SPEd 4 5 Carburation equipment: Carburettor Yes, if SPE Electronic control system, air flow meter, etc. Equipment for gas engines: Pressure reducer Yes. if SPE Yes. if SPE Yes. if SPE Yes, if SPE Evaporator Yes, if SPE Yes, if SPE

#### Table 1 — Equipment and auxiliaries to be installed for the test to determine engine power

	Mixer	Yes, if SPE	Yes, if SPE	Yes, if SPE
6	Fuel injection equipment [spark-ignition (petrol) and compression-ignition (diesel)]:			
	Prefilter	Yes, if SPE	Optional	Yes, if SPE or
				test bed equipment
	Filter	Yes, if SPE	Optional	Yes, if SPE
	Fuel injection pump	Yes, if SPE	Yes, if SPE	Yes, if SPE
	High-pressure pipes	Yes, if SPE	Yes, if SPE	Yes, if SPE
	Injector	Yes, if SPE	Yes, if SPE	Yes, if SPE <sup>e</sup>
	Air inlet valve	Yes, if SPE <sup>e</sup>	Yes, if SPE <sup>e</sup>	Yes, if SPE
	Electronic control system, air flow meter, etc.	Yes, if SPE	Yes, if SPE	Yes, if SPE
	Governor/control system	Yes, if SPE	Yes, if SPE	Yes, if SPE
	Automatic full-load stop for the control rack depending on atmospheric conditions	Yes, if SPE	Yes, if SPE	Yes, if SPE
7	Liquid-cooling equipment: Radiator	Yes, if SPE <sup>f</sup>	No	No
	Fan	Yes, if SPE <sup>f,g</sup>	Nof	No
	Fan cowl	Yes, if SPE <sup>f</sup>	No	No
	Water pump	Yes, if SPE <sup>f</sup>	Yes, if SPE	Yes, if SPE <sup>f</sup>
	iTeh SThermostat ARD	Yes, if SPEf,h	V Optional <sup>h</sup>	Yes, if SPE <sup>h</sup>
8	Air cooling: Cowl (standards it	Yes, if SPE <sup>f</sup>	No	No
	Fan or blower	Yes, if SPE <sup>f,g</sup>	Nof	No <sup>i</sup>
	Temperature-regulating device 0.2016	Yes, if SPE	No	No
9	Electrical equipment defenerator atalog/standards/sist/3	991 (Yess if SPE 463)	-8a <b>Ye</b> s, if SPE <sup>j</sup>	Yes, if SPE <sup>j</sup>
	Spark distributionsystem55	0-20 <b>¥é</b> s, if SPE	Yes, if SPE	Yes, if SPE
	Coil or coils	Yes, if SPE	Yes, if SPE	Yes, if SPE
	Wiring	Yes, if SPE	Yes, if SPE	Yes, if SPE
	Spark-plugs	Yes, if SPE	Yes, if SPE	Yes, if SPE
	Electronic control system including knock sensor/ spark-retard system	Yes, if SPE <sup>k</sup>	Yes, if SPE <sup>k</sup>	Yes, if SPE <sup>k</sup>
10	Pressure-charging equipment: Compressor driven either directly by the engine and/or by the exhaust gases:	Yes, if SPE	Yes, if SPE	Yes, if SPE
	Boost control	Yes, if SPE <sup>1</sup>	Yes, if SPE <sup>l</sup>	Yes, if SPE <sup>1</sup>
	Charge air cooler	Yes, if SPE <sup>f,g,m</sup>	Yes, if SPE <sup>f,g,m</sup>	Yes, if SPE, or test bed equip- ment <sup>i,m</sup>
	Coolant pump or fan (engine-driven)	Yes, if SPE	Yes, if SPE	No <sup>i</sup>
	Coolant flow control device	Yes, if SPE	Yes, if SPE	Yes, if SPE
11	Auxiliary test-bed fan	Yes, if necessary	Yes, if necessary	Yes, if necessary
12	Anti-pollution device	Yes, if SPEn	Yes, if SPE <sup>n</sup>	Yes, if SPE <sup>n</sup>
13	Lubricating oil pump	Yes, if SPE	Yes, if SPE	Yes, if SPE

 Table 1 (continued)

### Table 1 (continued)

NOTE "Yes, if SPE" means that this equipment shall be fitted for the engine power determination if it is Standard Production Equipment (SPE).
<sup>a</sup> — For net power/gross power test:
If used (for gross power test) and except in the case where there is a risk of the system having a noticeable influence upon engine power, an equivalent may be used. In this case, a check shall be made to ascertain that inlet depression does not differ by more than 100 Pa from the limit specified by the manufacturer for a clean air filter.
— For engine power test for ISO 8178:
The complete inlet system for the intended application shall be fitted
— where there is a risk of an appreciable effect on the engine power;
<ul> <li>in the case of naturally aspirated spark ignition engines;</li> </ul>
— when the manufacturer requests that this should be done.
In other cases, an equivalent system may be used and a check shall be made to ascertain that the inlet pres- sure does not differ by more than 100 Pa from the upper limit specified by the manufacturer for a clean air filter.
<sup>b</sup> — For net power test:
Except in the case where there is a risk of the system having a noticeable influence upon engine power, an equivalent system may be used. In this case, a check shall be made to ascertain that the back-pressure in the engine exhaust system does not differ by more than 1 000 Pa from the upper limit specified by the manufacturer.
— For gross power test:
If used and except in the case where there is a risk of the system having a noticeable influence upon engine power, an equivalent system may be used. In this case, a check shall be made to ascertain that the back-pressure in the engine exhaust system does not differ by more than 1 000 Pa from that specified by the manufacturer. However, a minimum loss system may be used.
- For engine power test for ISO 8178: ISO 15550:2016
The complete exhaust system for the intended application shall be fitted:
<ul> <li>where there is a risk of an appreciable effect on the engine power;</li> </ul>
<ul> <li>in the case of naturally aspirated spark ignition engines;</li> </ul>
— when the manufacturer requests that this should be done.
In other cases an equivalent system may be installed provided that the pressure measured does not differ by more than 1 000 Pa from the upper limit specified by the manufacturer.
<sup>c</sup> If an exhaust brake is incorporated in the engine, the throttle valve shall be fixed in the fully open position.
<sup>d</sup> If necessary, the fuel feed pressure may be adjusted to reproduce the fuel pressures existing in the particular engine application (particularly when a "fuel return" system, e.g. to tank or filter, is used).
<sup>e</sup> The air inlet valve is the control valve for the pneumatic governor of the injection pump. The governor or the fuel injection equipment may contain other devices which may affect the amount of fuel injected.

— For net power test:

The radiator, fan, fan cowl, water pump and thermostat shall be located on the test bed in the same relative positions that they are to occupy on the vehicle or machine. The cooling liquid circulation shall only be operated by the engine water pump.

Cooling of the liquid may be provided either by the engine radiator or by an external circuit, provided that the pressure loss of this circuit and the pressure at the pump inlet remains substantially the same as those of the engine cooling system. The radiator shutter, if incorporated, shall be set in the open position.

Where the fan, radiator and cowl system cannot conveniently be fitted to the engine, the power absorbed by the fan when separately mounted in its correct position in relation to the radiator and cowl (if used), shall be determined at the speeds corresponding to the engine speeds used for measurement of the engine power either by calculation from standard characteristics or by practical tests. This power, corrected to the standard atmospheric conditions defined in <u>Clause 5</u>, shall be deducted from the corrected power.

— For gross power test:

When the engine cooling fan or blower is of the fixed type, that is neither disconnectable nor progressive, and it is fitted for the test, then the power absorbed shall be added to the test results. The fan or blower power shall be determined at the speeds corresponding to the engine speeds used for the measurement of engine power either by calculation from standard characteristics or by practical tests.

— For engine power test for ISO 8178:

The cooling-liquid circulation shall only be operated by the engine pump. Cooling of the liquid may be produced by an external circuit, such that the pressure loss in this circuit and the pressure at the pump inlet remain substantially the same as those of the engine cooling system.

### g – For net power test**iTeh STANDARD PREVIEW**

Where a disconnectable or progressive fan or blower is incorporated, the test shall be performed with the fan or blower disconnected or with the progressive fan running at maximum slip.

— For gross power test:

<u>ISO 15550:2016</u>

Where a separate disconnectable or progressive fan or blower is incorporated for the charge air cooler, the test shall be performed with the disconnectable fan or blower disconnected or with the progressive fan running at maximum slip.

#### Table 1 (continued)

<sup>h</sup> The thermostat may be fixed in the fully open position.

<sup>1</sup> When the cooling fan or blower is fitted for the test, the power absorbed shall be added to the test results. The power absorbed by the fan or blower shall be determined at the speeds used for the test either by calculation from standard characteristics or by practical tests.

<sup>j</sup> The electrical power of the generator shall be the minimum. It shall be limited to that necessary for operation of accessories which are indispensable for engine operation. If the connection of a battery is necessary, a fully charged battery in good condition shall be used.

<sup>k</sup> The spark advance shall be representative of in-use conditions established with the minimum octane fuel recommended by the manufacturer.

<sup>1</sup> For engines equipped with variable boost as a function of charge or inlet air temperature, octane rating and/ or engine speed, the boost pressure shall be representative of in-vehicle or in-machine conditions established with the minimum octane fuel as recommended by the manufacturer.

<sup>m</sup> — For net power test/gross power test:

Charge air-cooled engines shall be tested with the charge air-cooling system operating, whether this system is liquid- or air-cooled. If the engine manufacturer prefers, a test bed system may replace an air-cooled cooler. In either case the measurement of power at each speed shall be made with the pressure drop and temperature drop of the engine air across the charge air cooler in the test bed the same as those specified by the manufacturer for the system on the complete vehicle or machine.

— For engine power test for ISO 8178:

Charge air-cooled engines shall be tested with the charge air-cooling system operating, whether this system is liquid- or air-cooled. If the manufacturer prefers, a test bed system may replace an air-cooled cooler. In either case, the measurement of power at each speed shall be made with the maximum pressure drop and the minimum temperature drop of the engine air across the charge air-cooler in the test bed system the same as those specified by the manufacturer.

<sup>n</sup> These may include, e.g. Exhaust Gas Recirculation (EGR), catalytic converter, thermal reactor, secondary air-supply and fuel evaporation protection systems. <u>ISO 135502016</u>

#### 3.3.3.1

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#### net power

power obtained on a test bed at the end of the crankshaft or its equivalent at the corresponding engine speed with the equipment and auxiliaries specified by ISO 1585, ISO 8665, ISO 9249 or ISO 4106

Note 1 to entry: If the power measurement can only be carried out with a mounted gear-box, the losses in the gear-box should be added to the measured power to give the net engine power.

#### 3.3.3.2

#### gross power

power obtained on a test bed at the end of the crankshaft or its equivalent at the corresponding engine speed with the equipment and auxiliaries specified by ISO 2534

Note 1 to entry: If the power measurement can only be carried out with a mounted gear-box, the losses in the gear-box should be added to the measured power to give the gross engine power.

#### 3.3.3.3

#### engine power for ISO 8178

power obtained on a test-bed at the end of the crank-shaft or its equivalent, at the *declared engine speed* (3.2.4) specified by the manufacturer at the *declared power* (3.3.1) with the engine being fitted only with the equipment and auxiliaries specified in ISO 14396

#### 3.3.4

#### continuous power

power which an engine is capable of delivering continuously, between the normal maintenance intervals stated by the manufacturer, at the stated speed and under stated ambient conditions, the maintenance prescribed by the manufacturer having been carried out

#### 3.3.5

#### overload power

power which an engine may be permitted to deliver, with a duration and frequency of use depending on the service application, at stated ambient conditions, immediately after operating at the *continuous power* (3.3.4) restricted to 1 h in a 12 h time span

#### 3.3.6

#### fuel stop power

power which an engine is capable of delivering during a stated period corresponding to its application, and stated speed and under stated ambient conditions, with the fuel limited so that this power cannot be exceeded

#### 3.3.7

#### **ISO** power

power determined under the operating conditions of the manufacturer's test bed and adjusted or corrected as determined by the manufacturer to the standard reference conditions specified in ISO 14396

#### 3.3.7.1

#### **ISO standard power**

continuous *brake power* (3.3.3) that the engine manufacturer declares that an engine is capable of delivering with only the essential dependent auxiliaries fitted, between the normal maintenance intervals as stated by the manufacturer, and under the following conditions:

- a) at a stated speed at the operating conditions of the engine manufacturer's test bed;
- b) with the *declared power* (3.3.1) adjusted or corrected as determined by the manufacturer to the standard reference conditions specified in ISO 14396, a)
- c) with the maintenance prescribed by the engine manufacturer having been carried out.

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#### **3.3.8** https://standards.iteh.ai/catalog/standards/sist/39910275-ad26-4630-8a62-

#### service power

power delivered under the ambient and operating conditions of an engine application

#### 3.3.8.1

#### service standard power

continuous *declared power* (3.3.1) that the engine manufacturer declares that an engine is capable of delivering, with only the essential dependent auxiliaries fitted, between the normal maintenance intervals stated by the manufacturer and under the following conditions:

- a) at a stated speed at the ambient and operating conditions of the engine application;
- b) with the *declared power* (3.3.1) adjusted or corrected as determined by the manufacturer to the stated ambient and operating conditions of the engine application;
- c) with the maintenance prescribed by the engine manufacturer having been carried out.

#### 3.3.9

#### power adjustment

calculation procedure by which a power value under one set of ambient conditions is modified to represent the power value expected under another set of ambient conditions, to maintain approximately constant thermal and/or mechanical load in critical engine components