Useful life means the period during which a new engine is required to comply with all applicable emission standards. The standard-setting part defines the specific useful-life periods for individual engines.

Variable-speed engine means an engine that is not a constant-speed engine.

Vehicle means any vehicle, vessel, or type of equipment using engines to which this part applies. For purposes of this part, the term ''vehicle'' may include nonmotive machines or equipment such as a pump or generator.

Verification means to evaluate whether or not a measurement system's outputs agree with a range of applied reference signals to within one or more predetermined thresholds for acceptance. Contrast with ''calibration''.

We (us, our) means the Administrator of the Environmental Protection Agency and any authorized representatives.

Work has the meaning given in §1065.110.

Zero means to adjust an instrument so it gives a zero response to a zero calibration standard, such as purified nitrogen or purified air for measuring concentrations of emission constituents.

Zero gas means a gas that yields a zero response in an analyzer. This may either be purified nitrogen, purified air, a combination of purified air and purified nitrogen. For field testing, *zero gas* may include ambient air.

[70 FR 40516, July 13, 2005, as amended at 73 FR 37346, June 30, 2008; 73 FR 59342, Oct. 8, 2008; 74 FR 8428, Feb. 24, 2009; 74 FR 56518, Oct. 30, 2009; 75 FR 23058, Apr. 30, 2010]

§1065.1005 Symbols, abbreviations, acronyms, and units of measure.

The procedures in this part generally follow the International System of Units (SI), as detailed in NIST Special Publication 811, 1995 Edition, ''Guide for the Use of the International System, of Units (SI),'' which we incorporate by reference in §1065.1010. See §1065.25 for specific provisions related to these conventions. This section summarizes the way we use symbols, units of measure, and other abbreviations.

(a) *Symbols for quantities.* This part uses the following symbols and units of measure for various quantities:

Symbol	Quantity	Unit	Unit symbol	Base SI units
%	percent	0.01	%	10^{-2}
α	atomic hydrogen to carbon ratio.	mole per mole	mol/mol	1
A	area	square meter	m^2	m^2
A_0	intercept of least squares regression.			
A_1	slope of least squares regression.			
β	ratio of diameters	meter per meter	m/m	1
β	atomic oxygen to carbon ratio	mole per mole	mol/mol	1
$C^{\#}$	number of carbon atoms in a molecule.			
d	Diameter	meter	m	m
DR	dilution ratio	mole per mol	mol/mol	1
ε	error between a quantity and its reference.			
e	brake-specific basis	gram per kilowatt hour	g/(kW.h)	$g.3.6^{-1}.10^{6}.m^{-2}.kgs^{2}$
F	F-test statistic.			
f	frequency	hertz	Hz	s^{-1}
f_n	rotational frequency (shaft)	revolutions per minute	rev/min	$2.pi.60^{-1}.s^{-1}$
γ	ratio of specific heats	(joule per kilogram kelvin) per (joule per kilogram kelvin).	(J/(kg.K))/(J/(kg.K)).	1
K	correction factor			1
l	length	meter	m	m
μ	viscosity, dynamic	pascal second	Pa's	$m^{-1}.kg.s^{-1}$
M	molar mass[1]	gram per mole	g/mol	$10^{-3}.kg.mol^{-1}$
m	mass	kilogram	kg	kg
$\dot{m}$	mass rate	kilogram per second	kg/s	$kg.s^{-1}$
v	viscosity, kinematic	meter squared per second	m^2/s	$m^2.s^{-1}$
N	total number in series.			
n	amount of substance	mole	mol	mol
$\dot{n}$	amount of substance rate	mole per second	mol/s	$mol.s^{-1}$
P	power	kilowatt	kW	$10^{3}.m^{2}.kg.s^{-3}$
PF	penetration fraction.			
p	pressure	pascal	Pa	$m^{-1}.kg.s^{-2}$
ρ	mass density	kilogram per cubic meter	kg/m^3	$kg.m^{-3}$

Symbol	Quantity	Unit	Unit symbol	Base SI units
r	ratio of pressures	pascal per pascal	Pa/Pa	1
R^2	coefficient of determination.			
Ra	average surface roughness	micrometer	μm	m^{-6}
$Re^{\#}$	Reynolds number.			
RF	response factor.			
RH %	relative humidity	0.01	%	10^{-2}
σ	non-biased standard deviation.			
S	Sutherland constant	kelvin	K	K
SEE	standard estimate of error.			
T	absolute temperature	kelvin	K	K
T	Celsius temperature	degree Celsius	°C	K–273.15
T	torque (moment of force)	newton meter	N·m	$m^2 \cdot kg \cdot s^{-2}$
t	time	second	s	s
Δt	time interval, period, 1/frequency.	second	s	s
V	volume	cubic meter	m^3	m^3
$\dot{V}$	volume rate	cubic meter per second	m^3/s	$m^3 \cdot s^{-1}$
W	work	kilowatt hour	kW.h	$3.6 \cdot 10^{-6} \cdot m^2 \cdot kg \cdot s^{-2}$
w_c	carbon mass fraction	gram per gram	g/g	1
x	amount of substance mole fraction 2.	mole per mole	mol/mol	1
$\bar{X}$	flow-weighted mean concentration.	mole per mole	mol/mol	1
y	generic variable.			

[1] See paragraph (f)(2) of this section for the values to use for molar masses. Note that in the cases of NO_X and HC, the regulations specify effective molar masses based on assumed speciation rather than actual speciation.
[2] Note that mole fractions for THC, THCE, NMHC, NMHCE, and NOTHC are expressed on a C_1 equivalent basis.

(b) *Symbols for chemical species.* This part uses the following symbols for chemical species and exhaust constituents:

Symbol	Species
Ar	argon.
C	carbon.
CH_4	methane.
C_2H_6	ethane.
C_3H_8	propane.
C_4H_{10}	butane.
C_5H_{12}	pentane.
CO	carbon monoxide.
CO_2	carbon dioxide.
H	atomic hydrogen.
H_2	molecular hydrogen.
H_2O	water.
He	helium.
^{85}Kr	krypton 85.
N_2	molecular nitrogen.
NMHC	nonmethane hydrocarbon.
NMHCE	nonmethane hydrocarbon equivalent.
NO	nitric oxide.
NO_2	nitrogen dioxide.
NO_X	oxides of nitrogen.
N_2O	nitrous oxide.
NOTHC	nonoxygenated hydrocarbon.
O_2	molecular oxygen.
OHC	oxygenated hydrocarbon.
^{210}Po	polonium 210.
PM	particulate mass.
S	sulfur.
SO_2	sulfur dioxide.
THC	total hydrocarbon.
ZrO_2	zirconium dioxide.

(c) *Prefixes.* This part uses the following prefixes to define a quantity:

Symbol	Quantity	Value
μ	micro	10^{-6}
m	milli	10^{-3}
c	centi	10^{-2}
k	kilo	10^3
M	mega	10^6

(d) *Superscripts.* This part uses the following superscripts to define a quantity:

Superscript	Quantity
overbar (such as $\bar{y}$)	arithmetic mean.
overdot (such as $\dot{y}$)	quantity per unit time.

(e) *Subscripts.* This part uses the following subscripts to define a quantity:

Subscript	Quantity
abs	absolute quantity.
act	actual condition.
air	air, dry
atmos	atmospheric.
cal	calibration quantity.
CFV	critical flow venturi.
cor	corrected quantity.
dil	dilution air.
dexh	diluted exhaust.
exh	raw exhaust.
exp	expected quantity.
i	an individual of a series.
idle	condition at idle.
in	quantity in.
init	initial quantity, typically before an emission test.
j	an individual of a series.
max	the maximum (i.e., peak) value expected at the standard over a test interval; not the maximum of an instrument range.
meas	measured quantity.

Subscript	Quantity
out	quantity out.
part	partial quantity.
PDP	positive-displacement pump.
ref	reference quantity.
rev	revolution.
sat	saturated condition.
slip	PDP slip.
span	span quantity.
SSV	subsonic venturi.
std	standard condition.
test	test quantity.
uncor	uncorrected quantity.
zero	zero quantity.

(f) *Constants.* (1) This part uses the following constants for the composition of dry air:

Symbol	Quantity	mol/mol
x_{Arair}	amount of argon in dry air	0.00934
x_{CO2air}	amount of carbon dioxide in dry air.	0.000375
x_{N2air}	amount of nitrogen in dry air	0.78084
x_{O2air}	amount of oxygen in dry air	0.209445

(2) This part uses the following molar masses or effective molar masses of chemical species:

Symbol	Quantity	g/mol (10^{-3} kg·mol^{-1})
M_{air}	molar mass of dry air	28.96559
M_{Ar}	molar mass of argon	39.948
M_{C}	molar mass of carbon	12.0107
M_{CO}	molar mass of carbon monoxide	28.0101
M_{CO2}	molar mass of carbon dioxide	44.0095
M_{H}	molar mass of atomic hydrogen	1.00794
M_{H2}	molar mass of molecular hydrogen	2.01588
M_{H2O}	molar mass of water	18.01528
M_{He}	molar mass of helium	4.002602
M_{N}	molar mass of atomic nitrogen	14.0067
M_{N2}	molar mass of molecular nitrogen	28.0134
M_{NMHC}	effective molar mass of nonmethane hydrocarbon[2]	13.875389
M_{NMHCE}	effective molar mass of nonmethane equivalent hydrocarbon[2]	13.875389
M_{NOx}	effective molar mass of oxides of nitrogen[3]	46.0055
M_{N2O}	effective molar mass of nitrous oxide	44.0128
M_{O}	molar mass of atomic oxygen	15.9994
M_{O2}	molar mass of molecular oxygen	31.9988
M_{C3H8}	molar mass of propane	44.09562
M_{S}	molar mass of sulfur	32.065
M_{THC}	effective molar mass of total hydrocarbon[2]	13.875389
M_{THCE}	effective molar mass of total hydrocarbon equivalent[2]	13.875389

[1] See paragraph (f)(1) of this section for the composition of dry air
[2] The effective molar masses of THC, THCE, NMHC, and NMHCE are defined by an atomic hydrogen-to-carbon ratio, α, of 1.85
[3] The effective molar mass of NOx is defined by the molar mass of nitrogen dioxide, NO_2

(3) This part uses the following molar gas constant for ideal gases:

Symbol	Quantity	J/(mol · K) ($m^2 \cdot kg \cdot s^{-2} \cdot mol^{-1} \cdot K^{-1}$)
R	molar gas constant	8.314472

(4) This part uses the following ratios of specific heats for dilution air and diluted exhaust:

Symbol	Quantity	[J/(kg·K)]/[J/(kg·K)]
γ_{air}	ratio of specific heats for intake air or dilution air.	1.399
γ_{dil}	ratio of specific heats for diluted exhaust.	1.399
γ_{exh}	ratio of specific heats for raw exhaust.	1.385

(g) *Other acronyms and abbreviations.* This part uses the following additional abbreviations and acronyms:

ASTM American Society for Testing and Materials.
BMD bag mini-diluter.
BSFC brake-specific fuel consumption.
CARB California Air Resources Board.
CFR Code of Federal Regulations.
CFV critical-flow venturi.
CI compression-ignition.
CITT Curb Idle Transmission Torque.
CLD chemiluminescent detector.
CVS constant-volume sampler.
DF deterioration factor.
ECM electronic control module.
EFC electronic flow control.
EGR exhaust gas recirculation.
EPA Environmental Protection Agency.

FEL Family Emission Limit
FID flame-ionization detector.
GC gas chromatograph.
GC–ECD gas chromatograph with an electron-capture detector.
IBP initial boiling point.
ISO International Organization for Standardization.
LPG liquefied petroleum gas.
NDIR nondispersive infrared.
NDUV nondispersive ultraviolet.
NIST National Institute for Standards and Technology.
PDP positive-displacement pump.
PEMS portable emission measurement system.
PFD partial-flow dilution.
PMP Polymethylpentene.
pt. a single point at the mean value expected at the standard.
PTFE polytetrafluoroethylene (commonly known as Teflon™).
RE rounding error.
RMC ramped-modal cycle.
RMS root-mean square.
RTD resistive temperature detector.
SSV subsonic venturi.
SI spark-ignition.
UCL upper confidence limit.
UFM ultrasonic flow meter.
U.S.C. United States Code.

[70 FR 40516, July 13, 2005, as amended at 73 FR 37346, June 30, 2008; 73 FR 59342, Oct. 8, 2008; 74 FR 56518, Oct. 30, 2009]

§ 1065.1010 Reference materials.

Documents listed in this section have been incorporated by reference into this part. The Director of the Federal Register approved the incorporation by reference as prescribed in 5 U.S.C. 552(a) and 1 CFR part 51. Anyone may inspect copies at the U.S. EPA, Air and Radiation Docket and Information Center, 1301 Constitution Ave., NW., Room B102, EPA West Building, Washington, DC 20460 or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202–741–6030, or go to: *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html*.

(a) *ASTM material*. Table 1 of this section lists material from the American Society for Testing and Materials that we have incorporated by reference. The first column lists the number and name of the material. The second column lists the sections of this part where we reference it. Anyone may purchase copies of these materials from the American Society for Testing and Materials, 100 Barr Harbor Dr., P.O. Box C700, West Conshohocken, PA 19428 or *www.astm.com*. Table 1 follows:

TABLE 1 OF § 1065.1010.–ASTM MATERIALS

Document No. and name	Part 1065 reference
ASTM D86–07a, Standard Test Method for Distillation of Petroleum Products at Atmospheric Pressure	1065.703, 1065.710
ASTM D93–07, Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester	1065.703
ASTM D445–06, Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)	1065.703
ASTM D613–05, Standard Test Method for Cetane Number of Diesel Fuel Oil	1065.703
ASTM D910–07, Standard Specification for Aviation Gasolines	1065.701
ASTM D975–07b, Standard Specification for Diesel Fuel Oils	1065.701
ASTM D1267–02 (Reapproved 2007), Standard Test Method for Gage Vapor Pressure of Liquefied Petroleum (LP) Gases (LP-Gas Method)	1065.720
ASTM D1319–03, Standard Test Method for Hydrocarbon Types in Liquid Petroleum Products by Fluorescent Indicator Adsorption	1065.710
ASTM D1655–07e01, Standard Specification for Aviation Turbine Fuels	1065.701
ASTM D1837–02a (Reapproved 2007), Standard Test Method for Volatility of Liquefied Petroleum (LP) Gases	1065.720
ASTM D1838–07, Standard Test Method for Copper Strip Corrosion by Liquefied Petroleum (LP) Gases	1065.720
ASTM D1945–03, Standard Test Method for Analysis of Natural Gas by Gas Chromatography	1065.715
ASTM D2158–05, Standard Test Method for Residues in Liquefied Petroleum (LP) Gases	1065.720
ASTM D2163–05, Standard Test Method for Analysis of Liquefied Petroleum (LP) Gases and Propene Concentrates by Gas Chromatography	1065.720
ASTM D2598–02 (Reapproved 2007), Standard Practice for Calculation of Certain Physical Properties of Liquefied Petroleum (LP) Gases from Compositional Analysis	1065.720
ASTM D2622–07, Standard Test Method for Sulfur in Petroleum Products by Wavelength Dispersive X-ray Fluorescence Spectrometry	1065.703, 1065.710
ASTM D2713–91 (Reapproved 2001), Standard Test Method for Dryness of Propane (Valve Freeze Method)	1065.720
ASTM D2784–06, Standard Test Method for Sulfur in Liquefied Petroleum Gases (Oxy-Hydrogen Burner or Lamp)	1065.720
ASTM D2880–03, Standard Specification for Gas Turbine Fuel Oils	1065.701