INTERNATIONAL STANDARD

ISO 8178-6

First edition
2000-11-01

Reciprocating internal combustion engines — Exhaust emission measurement —

Part 6: Report of measuring results and test

Moteurs alternatifs à combustion interne — Mesurage des émissions de gaz d'échappement —

Partie 6: Rapport de mesure et d'essai

Reference number
ISO 8178-6:2000(E)

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Printed in Switzerland

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 8178 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 8178-6 was prepared by Technical Committee ISO/TC 70, *Internal combustion engines*, Subcommittee SC 8, *Exhaust gas emission measurement*.

ISO 8178 consists of the following parts, under the general title *Reciprocating internal combustion engines — Exhaust emission measurement*:

— *Part 1: Test-bed measurement of gaseous and particulate exhaust emissions*

— *Part 2: Measurement of gaseous and particulate exhaust emissions at site*

— *Part 3: Definitions and methods of measurement of exhaust gas smoke under steady-state conditions*

— *Part 4: Test cycles for different engine applications*

— *Part 5: Test fuels*

— *Part 6: Report of measuring results and test*

— *Part 7: Engine family determination*

— *Part 8: Engine group determination*

— *Part 9: Test cycles and test procedures for test bed measurement of exhaust gas smoke emissions from compression ignition engines operating under transient conditions*

— *Part 10: Test cycles and test procedures for field measurement of exhaust gas smoke emissions from compression ignition engines operating under transitory conditions*

Annex A forms a normative part of this part of ISO 8178.

Introduction

Results of an emissions test shall be presented clearly and should include all information pertinent to the derivation of the emission test results. An accuracy or uncertainty analysis relevant to the test system used and engine being evaluated should be made by the laboratory. A record shall be made of the measurement equipment being used, the ambient conditions, the engine performance and the fuel used. Recommendations for the data to be recorded are given regardless to the type of fuel being used.

The data format recommended in this part of ISO 8178 is intended to be used by individuals measuring emissions using ISO 8178-1, ISO 8178-2, ISO 8178-9 or ISO 8178-10, but is not intended to contradict or replace existing data formats which may be required by some regulatory bodies.

As expressed in ISO 8178-1 and ISO 8178-2, the emission results shall be stated in either "g/kWh" (preferred) or in "g/m^3". It should be noted that some regulators require the results to be expressed in unique measurement units; this should be determined prior to testing.

Reciprocating internal combustion engines — Exhaust emission measurement —

Part 6:
Report of measuring results and test

1 Scope

This part of ISO 8178 specifies as a standard data format for reporting the measurement results of exhaust emissions from RIC engines for mobile, transportable and stationary use, excluding engines for motor vehicles primarily designed for road use. This part of ISO 8178 may be applied to engines used e.g. earth-moving machines, generating sets and for other applications. This part of ISO 8178 applies to measurement in the laboratory and at site.

For engines used in machinery covered by additional requirements, (e.g. occupational health and safety regulations, dust regulations for powerplants) additional test conditions and special evaluation methods may apply.

NOTE Since the standard report format defined in this part of ISO 8178 is intended to be applicable to all types of internal combustion engine, in certain cases some items are not necessary for specific engines and/or tests, especially when measuring at site. On the other hand, some additional items might be necessary according to test purposes. Deletion and addition of items to be reported should be based on agreement between the parties involved.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 8178. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 8178 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 8178-1:1996, *Reciprocating internal combustion engines — Exhaust emission measurement — Part 1: Test bed measurement of gaseous and particulate exhaust emissions.*

ISO 8178-2:1996, *Reciprocating internal combustion engines — Exhaust emission measurement — Part 2: Measurement of gaseous and particulate exhaust emissions at site*.

ISO 8178-3:1994, *Reciprocating internal combustion engines — Exhaust emission measurement — Part 3: Definitions and methods of measurement of exhaust gas smoke under steady-state conditions*.

ISO 8178-4:1996, *Reciprocating internal combustion engines — Exhaust emission measurement — Part 4: Test cycles for different engine applications*.

ISO 8178-5:1997, *Reciprocating internal combustion engines — Exhaust emission measurement — Part 5: Test fuels*.

ISO 8178-7:1996, *Reciprocating internal combustion engines — Exhaust emission measurement — Part 7: Engine family determination*.

ISO 8178-8:1996, *Reciprocating internal combustion engines — Exhaust emission measurement — Part 8: Engine group determination*.

ISO 8178-9:2000, *Reciprocating internal combustion engines — Exhaust emission measurement — Part 9: Test cycles and test procedures for test bed measurement of exhaust gas smoke emissions from compression ignition engines operating under transient conditions*.

ISO 8178-10:—[1)], *Reciprocating internal combustion engines — Exhaust emission measurement — Part 10: Test cycles and test procedures for field measurement of exhaust gas smoke emissions from compression ignition engines operating under transitory conditions*.

3 Terms and definitions

For the purposes of this part of ISO 8178, the terms and definitions given in ISO 8178-1, ISO 8178-2, ISO 8178-3, ISO 8178-4, ISO 8178-5, ISO 8178-7, ISO 8178-8, ISO 8178-9 and ISO 8178-10 apply.

4 Symbols and abbreviated terms

4.1 General symbols

See Table 1. For the EEC-UNO regulation equivalents of the symbols listed in Table 1 see ISO 8178-1.

Table 1 —General symbols

Symbol	Term	Unit
D	Dilution factor	1
F_{h}	Fuel specific factor used for the calculations of wet concentrations from dry concentrations	1
p_{Rv}	Reid vapour pressure	kPa
$q^*_{m\mathrm{dx}}$	Equivalent diluted exhaust gas mass flow rate on wet basis	kg/h
$q_{m\mathrm{dx}}$	Diluted exhaust gas mass flow rate on wet basis	kg/h
S_{L}	Lug smoke value	m^{-1}
S_{P}	Peak smoke value	m^{-1}
S_{S}	Steady state smoke value	m^{-1}
$q^*_{V\mathrm{dx}}$	Equivalent diluted exhaust gas volume flow rate on wet basis	m^3/h
$q_{V\mathrm{dx}}$	Diluted exhaust gas volume flow rate on wet basis	m^3/h
W_{f}	Weighting factor	1
W_{fe}	Effective weighting factor	1

1) To be published.

4.2 Symbols and abbreviations for the chemical components

CO Carbon monoxide

CO_2 Carbon dioxide

HC Hydrocarbons

NO_x Oxides of nitrogen

O_2 Oxygen

PT Particulates

SO_2 Sulfur dioxide

4.3 Abbreviations

CCAI Calculated carbon aromaticity index

CFPP Cold filter plugging point

CFV Critical flow venturi

CNG Compressed natural gas

CVS Constant volume sampling

DPT Differential pressure transducer

EGA Exhaust gas analyser

EOPL Effective optical path length

FBP Final boiling point

IBP Initial boiling point

LHV Lower heating value

LPG Liquefied petroleum gas

MON Motor octane number

PDP Positive displacement pump

RME Rapeseed methyl ester

RON Research octane number

5 Emissions test report

5.1 Introduction

The recommended test report consists of eleven data sheets (see annex A) that contain all the information pertinent to a test run in a very compact way. The test report is a single document that can be filed easily for later review of the test results by authorities, customers and engine manufacturers. It incorporates the final test results and the information needed to trace the final results to the values originally measured, as well as the information on the test engine, the test cell equipment and the test fuel. The report format is applicable to all test cycles and fuels.

5.2 General information

Table A.1 includes the information essential for engine approval, such as engine identification, engine application, test cycle and test identification. The emission test results may be listed for five different test cycles, if applicable. The gaseous and particulate emissions shall be expressed in grams per kilowatt hour whenever possible. Other units shall be indicated if used according to the provisions laid down in the scope. The smoke test results shall be listed for the smoke cycle applicable to the indicated application. The smoke values shall be expressed per metre whenever possible. Exceptions are only allowed if regulators require other units.

5.3 Engine information

Table A.2 contains the basic features of the engine under test. This information is sufficient to build up an engine with the same emission behaviour for confirmatory testing. If more information is demanded by authorities or customers, this may be appended to the test report. Table A.3 and Table A.4 contain other information to identify the features of the engine family and group respectively. These features are derived from ISO 8178-7 for engine family and ISO 8178-8 for engine group. If the engine family or group concept does not apply for the engine under test, Table A.3 or Table A.4 does not have to be submitted.

5.4 Ambient and engine test data

Table A.5 includes in the upper part the relevant ambient data, in the lower part the relevant engine data required to be recorded in ISO 8178-1. In most cases, mechanical shaft power will be used for the calculation of the final results. If other kinds of power are used, e.g. electrical, thermal or total power, this shall be indicated. Fuel flow, air flow and exhaust flow may be expressed as volume or mass flow rates, and the unit used shall be filled in. The measurement values shall be recorded for each mode individually (up to a maximum of 11), and the cycle value shall be calculated for the power and recorded in the column "Σ(C) $\times$ W_{fe}" where (C) stands for the component under consideration. The number of modes shall be used in accordance with ISO 8178-4.

5.5 Gaseous emissions data

Table A.6 contains in the upper part the originally measured (or calculated for SO_2) concentrations of the gaseous emissions either in the raw or dilute exhaust gas for each individual mode. The number of modes shall be used in accordance with clause 8 of ISO 8178-4:1996. The way of measurement (wet or dry) shall be indicated in the second column. In the case of dilute measurement the (average) background concentrations shall be reported in column B. The second block contains some correction or calculation factors whose values shall be recorded only if applicable. The third block contains the mode and average cycle (Σ(C) $\times$ W_{fe}) mass flow rates corrected for humidity (NO_x only) and to wet conditions where (C) stands for the component under consideration. The mass flow rates are the basis for the calculation of the other units like grams per kilowatt hour or grams per cubic metre.

5.6 Particulate emissions data

Table A.7 contains in the upper three blocks the measurement values required for the calculation of particulates for each individual mode. If the single filter method is used, the corresponding values shall be filled in under column "sum" (Σ). The number of modes shall be used in accordance with clause 8 of ISO 8178-4:1996. Use of a partial or full flow dilution system shall be indicated. For the dilution tunnel flow rate, the equivalent diluted exhaust gas flow rate on wet basis ($q^*_{m\mathrm{dx}}$ or $q^*_{V\mathrm{dx}}$) or diluted exhaust gas flow rate on wet basis ($q_{m\mathrm{dx}}$ or $q_{V\mathrm{dx}}$) shall be reported

depending on the system used. Some values (e.g. dilution ratio) are not required for certain systems. The particulate mass corresponds to the sum of the masses of both filters, including if weighed separately. If the particulate mass is corrected for background, the "b" shall be circled. The mass flow shall be reported as uncorrected and corrected for humidity for each individual mode and for the average cycle value ($\Sigma(C) \times W_{fe}$) where (C) stands for the component under consideration. Reporting of the smoke values during the emissions test cycle is optional. The unit of the smoke measurement value depends upon the system used. For the calculation of the soot concentration from the smoke value, the correlation function used shall be reported.

5.7 Smoke test data

Table A.8 contains the measurement values of the smoke cycles. The ambient data shall be reported for each test run to determine if the smoke values are to be corrected. If applicable, ambient density correction shall be applied, but the uncorrected smoke values shall also be reported. The mean values and the maximum difference between the test runs shall be reported whenever required according to Table A.8. Since different smoke cycles apply to different engine applications, the smoke values shall be reported in the appropriate lines. For the loaded transient test (C1 applications), the smoke values S_{P3}, S_{P6} and S_{P9} shall be reported under the columns run 1, run 2 and run 3 respectively.

5.8 Test cell information

Tables A.9 and A.10 contain information on the test cell and the measurement equipment. Not all of the information is required in ISO 8178-1 and ISO 8178-2, but filling in all applicable data is useful for confirmatory testing and interlaboratory comparisons. For the analysers, all measuring ranges used shall be reported, and the deviation shall be the maximum value found. The calibration curves, converter check results, hydrocarbon response factors and interference results shall be appended to the report. The values of the different pressure transducers, temperature sensors, and humidity sensors shall be reported in Table A.10. The type of dilution system shall be e.g. PDP, CFV, isokinetic, twin venturi or EGA, etc. The weighing chamber conditions may be reported as average values or as the range over the cycle.

5.9 Fuel characteristics

Table A.11 contains all fuel properties listed in ISO 8178-5. The fuel type shall be indicated, and the values required for the respective fuel shall be reported. In order to facilitate the use of this sheet, properties of different fuels with similar attributes (e.g. burning quality: cetane No. for diesel, RON for petrol) are combined in blocks.

Annex A
(normative)

Tables for emissions test report

Table A.1 — ISO 8178 Emissions test report — General information

ENGINE	MANUFACTURER:					
	TYPE (MODEL):					
	FAMILY:					
	RATED POWER:					
	RATED SPEED:					
	SERIAL NUMBER:					
APPLICATION [a]	CUSTOMER:					
	FINAL INSTALLATION:					
EMISSIONS TEST RESULTS						
CYCLE						UNIT
NO_x						g/kWh [b]
HC						g/kWh [b]
CO						g/kWh [b]
SO_2						g/kWh [b]
PT						g/kWh [b]
SMOKE CYCLE						
PEAK (S_P) [d]						m^{-1} [c]
LUG (S_L) [d]						m^{-1} [c]
STEADY STATE (S_S) [d]						m^{-1} [c]
TEST IDENTIFICATION	DATE/TIME :					
	TEST SITE/BENCH :					
	TEST NUMBER :					
TESTING COMPANY						
DATE OF REPORT						
PLACE OF TEST						
MANAGER OF THE TEST						
SIGNATURE						
NOTE						

[a] If applicable or if known

[b] Units other than g/kWh to be indicated

[c] Units other than m^{-1} to be indicated

[d] To be indicated in accordance with the requirements of the applicable smoke cycle

Table A.2 — ISO 8178 Emissions test report — Test engine information

MANUFACTURER	
ENGINE TYPE (MODEL)	
FAMILY IDENTIFICATION	
SERIAL NUMBER	
RATED SPEED	min^{-1}
RATED POWER	kW
INTERMEDIATE SPEED	min^{-1}
MAXIMUM TORQUE AT INTERMEDIATE SPEED	Nm
LOW IDLE SPEED	min^{-1}
HIGH IDLE SPEED	min^{-1}
STATIC INJECTION/IGNITION TIMING	° BTDC (BEFORE TOP DEAD CENTRE)
INJECTION/IGNITION TIMING CONTROL	NO YES
BORE	mm
STROKE	mm
DISPLACEMENT PER CYLINDER	cm^3
CYLINDER NUMBER and CONFIGURATION	
AUXILIARIES (SEE ISO 8178-1:1996, ANNEX B)	
MAXIMUM INLET DEPRESSION	kPa
MAXIMUM EXHAUST BACK PRESSURE	kPa
INTERCOOLER SETPOINT [a]	K
COOLING MEDIUM TEMPERATURE SPECIFICATION	K
FUEL TEMPERATURE SPECIFICATION	K
LUBRICATING OIL	

[a] If applicable

Table A.3 — ISO 8178 Emissions test report — Engine family information

NOTE If applicable, see ISO 8178-7:1996, clause 5.

MANUFACTURER		
FAMILY IDENTIFICATION		
COMBUSTION CYCLE		
COOLING MEDIUM		
INDIVIDUAL CYLINDER DISPLACEMENT		cm^3
CYLINDER NUMBER and CONFIGURATION		
METHOD OF AIR ASPIRATION		
FUEL TYPE		
COMBUSTION CHAMBER TYPE		
VALVE and PORTING CONFIGURATION SIZE and NUMBER CYLINDER HEAD CYLINDER WALL CRANKCASE		
FUEL SYSTEM TYPE		
MISCELLANEOUS FEATURES		
– EXHAUST GAS RECIRCULATION	NO	YES
– WATER INJECTION/EMULSION	NO	YES
– AIR INJECTION	NO	YES
– CHARGE COOLING SYSTEM	NO	YES
– EXHAUST AFTERTREATMENT	NO	YES (TYPE:)
– DUAL FUEL	NO	YES
– IGNITION TYPE		

Table A.4 — ISO 8178 Emissions test report — Engine group information

NOTE If applicable, see ISO 8178-8.

MANUFACTURER	
GROUP IDENTIFICATION	
BORE DIAMETER STROKE	mm mm
METHOD OF PRESSURE CHARGING	
CHARGE AIR COOLING SYSTEM	
MAXIMUM DECLARED POWER PER CYLINDER AT MAXIMUM DECLARED SPEED	kW
INJECTION TIMING RANGE	° BTDC (BEFORE TOP DEAD CENTRE)
FUEL DELIVERY RANGE	mg/INJECTION

Table A.5 — ISO 8178 Emissions test report — Ambient and engine test data

ENGINE _____ TEST SITE _____

RATED SPEED _____ min^{-1} TEST NUMBER _____

INTERMEDIATE SPEED _____ min^{-1} TEST CYCLE _____

COMMENTS _____

MODE		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	$\Sigma \times W_{fe}$ [a]
TIME AT BEGINNING OF EACH MODE													
AMBIENT DATA													
BAROMETRIC PRESSURE	kPa												xxxxxxx
INTAKE AIR TEMPERATURE	K												xxxxxxx
INTAKE AIR HUMIDITY	g/kg												xxxxxxx
ATMOSPHERIC FACTOR	—												xxxxxxx
ENGINE DATA													
SPEED	min^{-1}												xxxxxxx
AUXILIARY POWER[b]	kW												
DYNO SETTING	kW												xxxxxxx
POWER[c]	KW												
SPECIFIC FUEL CONSUMPTION	g/kWh												xxxxxxx
FUEL FLOW	[d]												xxxxxxx
AIR FLOW	[d]												xxxxxxx
EXHAUST FLOW	[d]												xxxxxxx
EXHAUST TEMPERATURE	K												xxxxxxx
FUEL TEMPERATURE	K												xxxxxxx
COOLANT TEMPERATURE	K												xxxxxxx
TEMPERATURE INTERCOOLED AIR	K												xxxxxxx
LUBRICANT TEMPERATURE	K												xxxxxxx
INLET DEPRESSION	kPa												xxxxxxx
EXHAUST BACKPRESSURE	kPa												xxxxxxx

[a] If applicable.

[b] If applicable; calculated value to be used according to ISO 8178-1:1996, 5.3.

[c] Other kind of power than mechanical (electrical, thermal, total) to be indicated; uncorrected.

[d] Units to be indicated.

Table A.6 — ISO 8178 Emissions Test Report: Gaseous Emissions Data

ENGINE _____ Raw _____ Dilute_____ TEST SITE _____

RATED SPEED _____ min^{-1} TEST NUMBER _____

INTERMEDIATE SPEED _____ min^{-1} TEST CYCLE _____

COMMENTS _____

MODE	[a]	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	B[b]
TIME AT BEGINNING OF EACH MODE													
NO_x CONCENTRATION ppm													
HC CONCENTRATION ($C1$) ppm													
CO CONCENTRATION ppm													
CO_2 CONCENTRATION %[c]													
O_2 CONCENTRATION %[c]													
NO_x HUMIDITY CORRECTION FACTOR K_h —													xxxxx
FUEL SPECIFIC FACTOR F_h —[b]													xxxxx
DRY/WET CORRECTION FACTOR K_w —[b]													xxxxx
DILUTION FACTOR D —[b]													xxxxx
													$\Sigma \times W_{fe}$
NO_x MASS FLOW [d] g/h													
NO_x MASS FLOW [e] g/h													
HC MASS FLOW g/h													
CO MASS FLOW [e] g/h													
SO_2 MASS FLOW [f] g/h													
CO_2 MASS FLOW [e] g/h													

[a] w(et) or d(ry) to be indicated.

[b] If applicable; B = Background.

[c] Units other than % to be indicated.

[d] Corrected for humidity (K_h) and to wet conditions (K_w).

[e] Corrected to wet conditions (K_w).

[f] Calculated.

Table A.7 — ISO 8178 Emissions test report — Particulate emissions data

ENGINE _____ PARTIAL/FULL FLOW _____ TEST SITE _____

RATED SPEED _____ min^{-1} TEST NUMBER _____

INTERMEDIATE SPEED _____ min^{-1} TEST CYCLE _____

COMMENTS _____

MODE		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	Σ[a]
TIME AT BEGINNING OF EACH MODE													
SAMPLING TIME	s												xxxxxxx
EFFECTIVE W_f [b]	—												xxxxxxx
TUNNEL FLOW [c]	[d]												[b]
DILUTION AIR FLOW [a]	[d]												[b]
DILUTION RATIO [a]	—												xxxxxxx
DILUTION AIR TEMPERATURE	K												xxxxxxx
EXHAUST TEMPERATURE AT PROBE [a]	K												xxxxxxx
TUNNEL TEMPERATURE	K												xxxxxxx
FILTER FACE TEMPERATURE	K												xxxxxxx
FILTER FACE VELOCITY	cm/s												xxxxxxx
FILTER PRESSURE DROP	kPa												[b]
PARTICULATE MASS b [e]	mg												[b]
SAMPLE MASS	kg												[b]
PARTICULATE CONCENTRATION	[d]												[b]
PARTICULATE HUMIDITY CORRECTION FACTOR	—												[b]
													$\Sigma \times W_{fe}$
PARTICULATE MASS FLOW	g/h												
PARTICULATE MASS FLOW [f]	g/h												
SMOKE	[d]												xxxxxxx
LIGHT ABSORPTION COEFFICIENT	1/m												xxxxxxx

[a] If applicable.

[b] To be filled in, if single filter method is used.

[c] q^*_{mdx}/q^*_{Vdx} or q_{mdx}/q_{Vdx}

[d] Units to be indicated.

[e] To circle, if background corrected.

[f] Corrected for humidity.

Table A.8 — ISO 8178 Emissions test report — Smoke test data

ENGINE _____ TEST SITE _____

RATED SPEED _____ min^{-1} INTERMEDIATE SPEED _____ min^{-1}

IDLE SPEED _____ min^{-1} TEST NUMBER _____

COMMENTS _____

RUN		1	2	3	4[a]	5[a]	DIFF	MEAN
AMBIENT DATA								
BAROMETRIC PRESSURE	kPa						----	----
INTAKE AIR TEMPERATURE	K						----	----
INTAKE AIR HUMIDITY	g/kg						----	----
SMOKE CORRECTION FACTOR	-						----	----
ATMOSPHERIC FACTOR	-						----	----
FREE ACCELERATION TEST[b]								
IDLING TIME	s						----	
FREE ACCELERATION TIME	s						----	
PEAK SMOKE VALUE S_P	[c]							
CORRECTED S_P [d]	[c]							
LOADED TRANSIENT TEST [b]								
IDLING TIME	s						----	
ACCELERATION TIME	s						----	
LINEARITY OF ENGINE SPEED	min^{-1}						----	
STABILIZING TIME AT RATED SPEED	s						----	
TIME RUNNING AT RATED SPEED	s						----	
LUG DOWN TIME	s						----	
TIME RETURNING TO IDLING	s						----	
PEAK SMOKE VALUE S_P [e]	[c]						----	----
CORRECTED S_P [d]	[c]						----	----
LUG SMOKE VALUE S_L	[c]						----	
CORRECTED S_L [d]	[c]						----	
ENGINE LOAD STEP[f]								
STEADY STATE SMOKE VALUE S_S	[c]							
CORRECTED S_S [d]	[c]							
PEAK SMOKE VALUE S_P	[c]							
CORRECTED S_P [d]	[c]							
TRANSIENT LOAD TEST[g]								
ACCELERATION TIME	s						----	----
PEAK SMOKE VALUE S_P	[c]							
CORRECTED S_P [d]	[c]							

[a] If required by validation criteria.

[b] Diesel powered off-road vehicles and off-road industrial equipment (C1 applications of ISO 8178-4:1996).

[c] Units to be indicated.

[d] If applicable, corrected for ambient density (see ISO 8178-9:—, 10.3.2).

[e] S_{P3}, S_{P6}, S_{P9} under run 1, run 2, run 3, respectively.

[f] Constant speed off-road engines (D2, G1 and G2 applications of ISO 8178-4:1996).

[g] Engines for marine propulsion and rail traction (E1, E2, E3, E5 and F applications of ISO 8178-4:1996).

Table A.9 — ISO 8178 Emissions Test Report: Test Cell Information

ENGINE _____ TEST SITE _____

TEST DATE _____

TEST NUMBER _____

EXHAUST PIPE	DIAMETER	LENGTH	INSULATING LENGTH		
	mm	m	m		
	MANUFACTURER	MODEL	MEASURING RANGES	CALIBRATION DATE	DEVIATION[a]
NO_x ANALYSER[b]			ppm		%
HC ANALYSER[b]			ppm		%
CO ANALYSER[b]			ppm		%
CO_2 ANALYSER[b]			%		%
O_2 ANALYSER[b]			%		%
					DEVIATION [c]
SPEED					%
TORQUE			Nm		%
FUEL FLOW [d]					%
AIR FLOW [d]					%
EXHAUST FLOW [d]					%
CVS FLOW [d]					%
PROPANE CHECK	xxxxxxxx	xxxxxxxx	xxxxxxxxx		%
DILUTION AIR FLOW [d]					%
DILUTION EXHAUST FLOW [d]					%
PT SAMPLE FLOW [d]					%
SMOKE [d]					%
	TYPE	PARTIAL/FULL	ARRANGEMENT	OPERATING TEMPERATURE	EOPL
	[e]		[e]	K	mm
DILUTION SYSTEM	PARTIAL/FULL	TUNNEL DIAMETER	MIXING LENGTH	TYPE	HEAT EXCHANGER
		mm	mm		YES/NO
SECONDARY DILUTION TUNNEL	DIAMETER	RESIDENCE TIME	FILTER HOLDER DISTANCE		
	mm	s	mm		
	LENGTH	DIAMETER			
TRANSFER TUBE	mm	mm			
PT TRANSFER TUBE	mm	mm			
PARTICULATE	MANUFACTURER	TYPE	DIAMETER	STAIN DIAMETER	
FILTER			mm	mm	
WEIGHING	TEMPERATURE	RELATIVE HUMIDITY	ABSOLUTE HUMIDITY		
CHAMBER	K	%	g/kg		

[a] Maximum deviation from linearity see ISO 8178-1:1996, 8.5.6.

[b] See ISO 8178-1:1996, 7.4.

[c] Measured deviation see ISO 8178-1:1996, Table 2 and Table 3.

[d] Units to be indicated.

[e] Type: filter type or opacimeter; Arrangement: in-line or end-of-line.

Table A.10 — ISO 8178 Emissions test report — Test cell information (temperatures and pressures)

ENGINE _____ TEST SITE _____

TEST DATE _____

TEST NUMBER _____

	MANUFACTURER	MODEL	MEASURING RANGES	CALIBRATION DATE	DEVIATION [a]
TEMPERATURES					
COOLANT			K		K
LUBRICANT			K		K
EXHAUST GAS			K		K
INLET AIR			K		K
INTERCOOLED AIR			K		K
FUEL			K		K
DILUTION AIR			K		K
DILUTION TUNNEL			K		K
FILTER HOLDER			K		K
TRANSFER TUBE			K		K
PT TRANSFER TUBE			K		K
DILUTION EXHAUST GAS			K		K
WEIGHING CHAMBER			K		K
PRESSURES					
EXHAUST GAS			kPa		%
INLET MANIFOLD			kPa		%
BAROMETRIC			kPa		%
BOOST [b]			kPa		%
DPT [b]			Pa		%
DILUTION EXHAUST GAS			kPa		%
PARTICULATE FILTER			kPa		%
VAPOUR PRESSURE INTAKE AIR			kPa		%
VAPOUR PRESSURE DILUTION AIR			kPa		%
HUMIDITIES					
INLET AIR			%		%
DILUTION AIR			%		%
WEIGHING CHAMBER			%		%
			g/kg		g/kg

[a] Measured deviation see ISO 8178-1:1996, Table 2 and Table 3.

[b] If applicable.

Table A.11 — ISO 8178 Emissions Test Report: Fuel Characteristics

ENGINE _____ TEST SITE _____

TEST DATE _____

TEST NUMBER _____

FUEL TYPE PETROL _____ DIESEL _____ HEAVY OIL _____ CNG _____

LPG _____ RME _____ METHANOL _____ OTHER _____

PROPERTY	UNIT	METHOD [a]	RESULT	PROPERTY	UNIT	METHOD [a]	RESULT
DENSITY	kg/l	ISO 3675		SULFUR CONTENT	% mass	ISO 4260 ISO 8754	
CLOUD POINT	°C	ISO 3015		LEAD CONTENT	g/l	ISO 3830	
POUR POINT	°C	ISO 3016		WATER CONTENT	% mass	ISO 3733	
FLASH POINT	°C	ISO 2719		ASH CONTENT	% mass	ISO 6245	
CFPP	°C	EN 116		CARBON RESIDUE	% mass	ISO 6615	
VISCOSITY	mm^2/s	ISO 3104		SEDIMENT	% mass	ISO 3735	
p_{Rv}	KPa	ISO 3007		EXISTENT GUM	mg/ml	ISO 6246	
DISTILLATION		ISO 3405	xxx	OXIDATION STABILITY	min	ISO 7536	
IBP	°C			COPPER CORROSION	—	ISO 2160	
10 vol-%	°C			OXYGENATES	% vol.		
50 vol-%	°C			ALUMINIUM/SILICON	mg/kg	ISO 10478	
90 vol-%	°C			VANADIUM	mg/kg	ISO 8691	
FBP	°C			ELEMENTAL ANALYSIS			xxx
RESIDUE	% vol.			CARBON	% mass		
AT 70 °C	% vol.			HYDROGEN	% mass		
AT 100 °C	% vol.			NITROGEN	% mass		
AT 180 °C	% vol.			OXYGEN	% mass		
AT 250 °C	% vol.			*LHV*	MJ/kg		
AT 350 °C	% vol.			METHANE	% mol		
CETANE No.	—	ISO 5165		ETHANE	% mol		
CETANE INDEX	—	ISO 4264		PROPANE	% mol		
CCAI	—	ISO 8217		BUTANE	% mol		
RON	—	ISO 5164		PENTANE	% mol		
MON	—	ISO 5163		HEXANE	% mol		
SENSITIVITY	—	ISO 5164 ISO 5163		ETHYLENE	% mol		
HYDROCARBONS		ISO 3837		PROPYLENE	% mol		
OLEFINS	% vol.			METHANOL	% mass		
AROMATICS	% vol.			ACID NUMBER	mg/g	ISO 660	
PARAFFINS	% vol.			GLYCERIDES	% mass		
BENZENE	% vol.	EN 238		TOTAL GLYCEROL	% mass		

[a] Method other than listed here, to be indicated.

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ICS 13.040.50; 27.020

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