STANDARDIZATION ORGANIZATION FOR G.C.C (GSO)

GSO 1040/2000

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MOTOR VEHICLES – ALLOWABLE LIMITS OF POLLUTANTS EMITTED TO THE ATMOSPHERE FROM LIGHT DUTY DIESEL ENGINED VEHICLES

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MOTOR VEHICLES – ALLOWABLE LIMITS OF POLLUTANTS EMITTED TO THE ATMOSPHERE FROM LIGHT DUTY DIESEL ENGINED VEHICLES

1- SCOPE AND FIELD OF APPLICATION

This standard is concerned with the allowable limits of gaseous pollutants and smoke emitted to the atmosphere from new light duty vehicles with maximum weight equal to or less than 3500 kg powered by diesel engines.

2- COMPLEMENTARY REFERENCES

2.1 GSO 48/1984 "Motor Vehicles – Conformity Certificates".

2.2 GSO 153/1993 "Motor Vehicles – Conformity Certificates for Vehicles Manufactured in Multi – Stages".

2.3 GSO 1041/2000 Motor Vehicles - Methods of Testing for Pollutants Emitted from Diesel Engined Vehicles - Part 1: Determination of Exhaust Gaseous Pollutants".

2.4 GSO 1042/2000 Motor Vehicles - Methods of Testing for Pollutants Emitted from Diesel Engined Vehicles - Part 2: Determination of Smoke".

3- DEFINITIONS

3.1 Gaseous pollutants: Substances airborne to atmosphere, which arise during the running of the vehicle, due to exhaust gases. They include carbon monoxide, hydrocarbons and oxides of nitrogen.

3.2 Exhaust gases: Gases produced by combustion of the fuel, emitted to the atmosphere at any point downstream of the exhaust ports of the engine.

3.3 Smoke: Particulate matter in the exhaust emissions which obscures the transmission of light.

3.4 Light duty vehicles: Any motor vehicle having a maximum weight equal to or less than 3500 kg.

3.5 Maximum weight: The kerb weight together with the maximum load declared by the manufacturer.

3.6 Kerb weight: The weight of the vehicle with standard equipment, maximum capacity of engine fuel, oil and coolant, the spare wheel, tools and, (if so equipped), the air conditioning system.

3.7 Reference weight of vehicle (rw): The kerb weight + 100 kg.

4- REQUIREMENTS

The following shall be met:

4.1 The mass of gaseous pollutants in the exhaust gases shall not exceed the amounts given in Table (1) when testing the vehicle in accordance with Gulf Standard No. 1041/2000 "Motor Vehicles - Methods of Testing for Pollutants Emitted from Diesel Engined Vehicles - Part 1: Determination of Exhaust Gaseous Pollutants".

TABLE (1)

Maximum Masses of Gaseous Pollutants and Reference Weight of Vehicle

Reference weight of vehicle (rw) (kg)	Mass of Carbon Monoxide (CO) (g/test)		Combined mass of Hydrocarbons (HC) oxides of Nitrogen (No_x) (g/test)	
	Type test	Acceptance test	Type test	Acceptance test
rw ≤ 1020	58	70	19	23.8
1020 < rw ≤ 1250	67	80	20.5	25.6
1250 < rw ≤ 1470	76	91	22	27.5
1470 < rw ≤ 1700	84	101	23.5	29.4
1700 < rw ≤ 1930	93	112	25	31.3
1930 < rw ≤ 2150	101	121	26.5	33.1
2150 < rw ≤ 3500	110	132	28	35

4.2 The light absorption coefficient of the exhaust gases shall not exceed the respective limits for k specified in Table (2) when testing the vehicle/engine, in accordance with Gulf Standard No. GSO 1042/2000 "Motor Vehicles - Methods of Testing for Pollutants Emitted from Diesel Engined Vehicles - Part 2: Determination of Smoke". In case of engines equipped with an exhaust driven supercharger, the absorption coefficient measured under free acceleration shall not exceed the respective limit for k, specified in Table (2), plus 0.5 m^{-1}, for the nominal flow value corresponding to the maximum absorption coefficient measured during the test at steady speeds.

TABLE (2)

Exhaust Gas Flow and Absorption Coefficient

Nominal flow (g) litres/second	Absorption coefficient (k) m^{-1}
≤ 42	2.26
45	2.19
50	2.08
55	1.985
60	1.90
65	1.84
70	1.775
75	1.72
80	1.665
85	1.62
90	1.575
95	1.535
100	1.495
105	1.465
110	1.425
115	1.395
120	1.37
125	1.345
130	1.32
135	1.30
140	1.27
145	1.25
150	1.225

TABLE (2) (continued)

Nominal flow (g) litres/second	Absorption coefficient (k) m^{-1}
155	1.205
160	1.19
165	1.17
170	1.155
175	1.14
180	1.125
185	1.11
190	1.095
195	1.08
≥ 200	1.065

***NOTES**:*

(1) If the value of the nominal flow is between the values given in the Table (2), the limit value applicable shall be obtained by interpolation.

(2) m^{-1} denotes: Absorption coefficient measured per meter length.

4.3 There shall be no emission from the crankcase of the vehicle to the atmosphere.

5- TESTING

5.1 The manufacturer shall supply the testing authorities with all technical data required for carrying out the tests as specified in appendix (A).

5.2 Sampling

5.2.1 Type test:

One vehicle or engine of the new type or kind shall be taken.

5.2.2 Acceptance test

One or more vehicles of the same type or kind, as provided for in item (7.3), shall be taken from the consignment.

5.3 Methods of Testing

Testing shall be carried out in accordance with the following Gulf Standards:

5.3.1 GSO 1041/2000 “Motor Vehicles - Methods of Testing for Pollutants Emitted from Diesel Engined Vehicles - Part 1: Determination of Exhaust Gaseous Pollutants”.

5.3.2 GSO 1042/2000 “Motor Vehicles - Methods of Testing for Pollutants Emitted from Diesel Engined Vehicles - Part 2: Determination of Smoke”.

5.4 Tests

The following tests shall be carried out on the sample vehicle withdrawn in accordance with (5.2).

5.4.1 Determination of exhaust gaseous pollutants.

5.4.2 Determination of smoke.

6- INSTRUCTION BOOKLET

The manufacturer shall supply with each vehicle, a booklet, in English, or Arabic or both, including instructions for the maintenance of the vehicle in relation to the control of emissions, within the limits specified in this standard.

7- CRITERIA OF TECHNICAL CONFORMITY

7.1 The criteria of technical conformity shall be in accordance with the requirements specified in Gulf Standard No. GSO 48/1984 “Motor Vehicles - Conformity Certificates”.

7.2 Vehicle subjected to type test

7.2.1 The vehicle shall be considered complying with the requirement specified in item 4.1 of this standard, if the measured mass of carbon monoxide and the combined mass of hydrocarbon and oxides of nitrogen, are less than or equal to 0.70 of the allowable limits mentioned in Table (1).

7.2.2 The test shall be repeated if in the initial test, the measured masses of both the carbon monoxide and the combined value of hydrocarbons and oxides of nitrogen are less than or equal to 0.85 of their allowable limits and one of these values is greater than 0.70 of its allowable limit.

7.2.3 The vehicle shall be considered complying with the requirement mentioned in item 4.1 of this standard if the measured masses of both the carbon monoxide and the combined value hydrocarbons and oxides of nitrogen in the second test, is less than its allowable limit and if the sum of the masses of both the carbon monoxide and the combined value of hydrocarbons and oxides of nitrogen in the two tests is less than 1.70 of the allowable limit.

7.2.4 The test shall be carried out a third time if the sum of the masses of both the carbon monoxide and the combined value of hydrocarbons and oxides of nitrogen in the two previous test is greater than 1.70 of the allowable limit or the measured mass of both the carbon monoxide and the combined value of hydrocarbons and oxides of nitrogen in either of those tests, is equal to or greater than the allowable limit and not more than 1.1 times the allowable limit.

7.2.5 The vehicle shall be considered complying with the requirement mentioned in item 4.1 of this standard, if the arithmetic means of the masses of both the carbon monoxide and the combined value of hydrocarbons and oxides of nitrogen in the three tests is less than or equal to allowable limit and not more than one of the masses for each pollutant (carbon monoxide and the combined mass of hydrocarbons and oxides of nitrogen) in the three tests exceeds 1.1 times the allowable limit.

7.2.6 The vehicle shall be considered non-complying with the requirement mentioned in item 4.1 if more than one of the measured masses of both the carbon monoxide and the combined value of hydrocarbons and oxides of nitrogen in the three tests exceed 1.1 times the allowable limit for the pollutant.

7.3 Vehicles subjected to acceptance tests

7.3.1 The consignment shall be accepted without carrying out the tests mentioned in item 5.4 in the case of acceptance of the certificate accompanying the consignment.

7.3.2 If the certificate is not accepted or whenever otherwise deemed necessary, tests mentioned in item 5.4 shall be carried out on the sample vehicle taken as in item 5.2.

7.3.3 The vehicle taken is subjected to the test under free acceleration and if the absorption coefficient determined does not exceed by more than 0.5 m^{-1} to the limits specified in Table (2), then the vehicle shall be considered complying with the requirement specified in item 4.2 of this standard. If exceed the vehicle is subjected to the test at full load steady speed. The vehicle shall be considered complying with the requirement specified in item 4.2 of this standard, if the absorption coefficient determined is less than or equal to the limits specified in Table (3).

7.3.4 Should the first sample fail the test the manufacturer may ask for measurement to be performed on a sample of vehicles taken from the consignment and including the vehicle originally taken. The manufacturer shall determine the size (n) of the sample. Vehicles other than the vehicle originally taken shall be subjected to a test specified in (5.3.1). The arithmetical mean m of the results obtained with the sample shall then be determined for both the carbon monoxide and the combined value of hydrocarbons and oxides of nitrogen. The consignment shall then be deemed to conform if the following condition is met:

$$\overline{m} + k.S \leq L$$

Where:

L is the limit value laid down in Table (1) for the emissions of carbon monoxide and the combined emissions of hydrocarbons and oxides of nitrogen.

S is the value obtained from the following equation:

$$S^2 = \sum \frac{(m - \overline{m})^2}{n - 1}$$

m is any one of the individual results obtained with the sample n, and

k is a statistical factor depending on (n) and given in the Table (3).

TABLE (3)

Sample Size and Statistical Factor

n	2	3	4	5	6	7	8	9	10
k	0.973	0.613	0.489	0.421	0.376	0.342	0.317	0.296	0.279
n	11	12	13	14	15	16	17	18	19
k	0.265	0.253	0.242	0.233	0.224	0.216	0.210	0.203	0.198

If $n \geq 20$ $\quad k = \frac{0.860}{\sqrt{n}}$

APPENDIX (A)

Essential Technical Data of the Engine / vehicle.

1	Engine
1.1	Make
1.2	Type
1.3	Cycle: four-stroke/two stroke
1.4	Cylinders:
1.4.1	Number and layout of cylinders
1.4.2	Bore (mm)
1.4.3	Capacity
1.5	Stroke (mm)
1.6	Compression ratio
1.7	Idle Speed (rpm)
1.8	Maximum no load speed (rpm)
1.9	Maximum Power Engine Speed (kw/rpm)
1.10	Maximum Torque (Nm/rpm)
1.11	System of Cooling: Air cooling/Liquid cooling
1.12	Electronic Ignition: Yes/No
1.13	Crankcase Ventilation System
	Supercharger: with/without
1.14	Air cleaner.
2.	Description of additional anti-smoke device.
3.	Description of air intake system.
4.	Description of fuel feed.
4.1	Feed pump: pressure.
4.2	Injection pump
4.2.1	Make
4.2.2	Type
4.2.3	Delivery
4.3	Injection nozzle
4.3.1	Make
4.3.2	Type
4.3.3	Opening pressure

4.4	Governor
4.4.1	Make
4.4.2	Type
4.4.3	Speed at which cut-off starts under full load (rpm)
4.5	Cold Start System
4.5.1	Make
4.5.2	Type
5.	Valve timing
6.	Additional information on test conditions
6.1	Lubricant used
6.1.1	Make
6.1.2	Type
6.1.3	Viscosity
6.2	Accelerating (0-100 km/h)
6.3	Maximum designed speed of vehicle:
6.4	Fuel consumption
6.4.1	90 km/h (L/100 km):
6.4.2	120 km/h (L/100 km):
6.5	Transmission:
6.6	Steering (Type):