INTERNATIONAL STANDARD

ISO 16750-5

Second edition
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Road vehicles — Environmental conditions and testing for electrical and electronic equipment —

Part 5: Chemical loads

Véhicules routiers — Spécifications d'environnement et essais de l'équipement électrique et électronique —

Partie 5: Contraintes chimiques

Reference number
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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 16750-5 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electrical and electronic equipment*.

This second edition cancels and replaces the first edition (ISO 16750-5:2003), which has been technically revised.

ISO 16750 consists of the following parts, under the general title *Road vehicles — Environmental conditions and testing for electrical and electronic equipment*:

— *Part 1: General*

— *Part 2: Electrical loads*

— *Part 3: Mechanical loads*

— *Part 4: Climatic loads*

— *Part 5: Chemical loads*

Road vehicles — Environmental conditions and testing for electrical and electronic equipment —

Part 5: Chemical loads

1 Scope

This part of ISO 16750 applies to electrical and electronical systems/components for road vehicles. This part of ISO 16750 describes the potential environmental stresses and specifies tests and requirements recommended for the specific mounting location on/in the road vehicle.

This part of ISO 16750 describes chemical loads. It is not designed to evaluate whether an electrical/electronic system/component is suitable for performing during continuous contact with an agent, such as a fuel pump immersed continuously in fuel.

NOTE Conditions and testing for a continuous contact can be determined from other standards or agreed upon between customer and supplier.

2 Normative references

The following referenced documents are indispensable for the application 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 16750-1, *Road vehicles — Environmental conditions and testing for electrical and electronic equipment — Part 1: General*

ISO 16750-4, *Road vehicles — Environmental conditions and testing for electrical and electronic equipment — Part 4: Climatic loads*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 16750-1 apply.

4 Tests

4.1 General

Components and associated parts that can come into contact with the specified chemical agents shall be resistant to those agents. The components and associated parts shall be tested with all agents they are likely to come into contact with, except for those materials which can be shown by documentary evidence to be immune to the contaminant and which need not be tested.

A material is considered to be immune to a contaminant if there is no change in properties sufficient to affect material performances over the time and at the temperature specified in this clause.

Manufacturer and type of chemical agents shall be agreed upon between supplier and vehicle manufacturer.

Resistance to the specified chemical agents shall be considered as early as during the material selection process.

4.2 Purpose

The purpose of the test is to determine whether the device under test (DUT) is unacceptably affected by temporary exposure to contaminating agents.

NOTE This test is not intended to be a life test.

4.3 General test conditions

Chemical agents shall be selected in accordance with Table 1, depending on the mounting location of the DUT.

Unless otherwise specified, one DUT per test agent shall be used. The DUTs shall be tested with all agents they are likely to come into contact with, except for those materials which can be shown by documentary evidence to be immune to the contaminant and which need not be tested.

The following tests describe one test cycle. Unless otherwise specified, one test cycle with one agent per DUT shall be performed. Any other number of cycles may be agreed between customer and supplier.

NOTE If the size of the DUT is sufficient, multiple test agents can be applied partially on one DUT if it is ensured that these do not have any influence on each other.

4.4 DUT conditioning

Unless otherwise specified, the DUT shall be stored at a room temperature (RT) of (23 ± 5) °C and a relative humidity (RH) of between 25 % and 75 % until temperature and humidity are stabilized.

The DUT shall be tested under conditions of normal use. If necessary, and unless otherwise specified, unrepresentative coatings or contaminations of the DUT shall be removed.

If a cleaning procedure is needed, the methodology shall be agreed between customer and supplier.

4.5 Test agent conditioning

Unless otherwise specified, all test agents shall be stabilized at an RT of (23 ± 5) °C when applied on the DUT.

4.6 Application method

Unless otherwise specified, application shall be performed at an RT of (23 ± 5) °C and an RH of between 45 % and 75 %.

It shall be ensured by the choice of the application method that the DUT is sufficiently wetted by the test agent in the areas to be tested. The application method shall be chosen in accordance with Table 2, depending on the agent and the mounting location of the DUT.

The preferred application methods are given in Table 1.

4.7 Test conditions

Unless otherwise specified, the exposure of the DUT to the agent applied shall be performed at the temperature and for the duration specified in Table 1.

Table 1 — Chemical loads for equipment depending on the mounting location and test conditions

ID	Chemical agents	Mounting location [code][a]					Exposure conditions	
		Engine compartment [A][b]	Passenger compartment [B][b]	Luggage compartment [C][b]	Mounting on the exterior [D][b]	Other require-ments [Z][b]	Test tempe-rature °C	Test duration
AA	Diesel fuel	I, III, IV, V	c	c	c	As agreed	T_{max}[d]	22 h
AB	"Bio" diesel	I, III, IV, V	c	c	c	As agreed	T_{max}[d]	22 h
AC	Petrol/gasoline unleaded	I, III, IV, V	c	c	c	As agreed	RT	10 min
AD	Kerosene	c	c	II, III, IV, V	c	As agreed	RT	10 min
AE	Methanol	II, III, IV, V, VI	c	c	c	As agreed	RT	10 min
BA	Engine oil	II, III, IV, V	c	c	c	As agreed	T_{max}[d]	22 h
BB	Differential oil	II, III, IV, V, VI	c	c	c	As agreed	T_{max}[d]	22 h
BC	Transmission fluid	II, III, IV, V, VI	c	c	c	As agreed	T_{max}[d]	22 h
BD	Hydraulic fluid	II, III, IV, V	c	c	c	As agreed	T_{max}[d]	22 h
BE	Greases	II, III	c	c	c	As agreed	T_{max}[d]	22 h
BF	Silicone oil	I, II, III, V	c	c	c	As agreed	T_{max}[d]	22 h
CA	Battery fluid	III, V	III, V	III, V	c	As agreed	RT	22 h
CB	Brake fluid	II, III, V	c	c	c	As agreed	T_{max}[d]	22 h
CC	Antifreeze fluid	I, III, IV, V, VI	c	c	c	As agreed	T_{max}[d]	22 h
CD	Urea	II, III, V	c	c	II, III, V	As agreed	T_{max}[d]	22 h
CE	Cavity protection	c	c	c	II, III	As agreed	RT	22 h
CF	Protective lacquer	I, II	c	c	I, II	As agreed	RT	22 h
CG	Protective lacquer remover	I, III, IV, V	c	c	I, III, IV, V	As agreed	T_{max}[d]	22 h
DA	Windscreen washer fluid	II, III, IV, V	c	II, III, IV, V	II, III, IV, V	As agreed	RT	2 h
DB	Vehicle washing chemicals	I, II, III, IV, V	c	c	I, II, III, IV, V	As agreed	RT	2 h
DC	Interior cleaner	c	I, III	I, III	c	As agreed	RT	2 h
DD	Glass cleaner	c	I, III	I, III	I, III	As agreed	RT	2 h
DE	Wheel cleaner	c	c	c	I, II, III, IV	As agreed	RT	2 h
DF	Cold cleaning agent	I, II, III, IV, V, VI	c	I, II, III, IV, V, VI	I, II, III, IV, V, VI	As agreed	RT	22 h
DG	Acetone	c	I, II, III	c	c	As agreed	RT	10 min
DH	Cleaning solvent	I, II, III	c	c	c	As agreed	RT	10 min
DJ	Ammonium-containing cleaner	c	II, III, V	II, III, V	II, III, V	As agreed	RT	22 h
DK	Denatured alcohol	I, II, III, IV, V	I, II, III, IV, V	I, II, III, IV, V	I, II, III, IV, V	As agreed	RT	10 min
EA	Contact spray	I, II, III	c	c	c	As agreed	T_{max}[d]	22 h
EB	Transpiration	c	II, III, V	c	c	As agreed	RT	22 h

Table 1 (*continued*)

ID	Chemical agents	Mounting location [code][a]					Exposure conditions	
		Engine compartment [A][b]	Passenger compartment [B][b]	Luggage compartment [C][b]	Mounting on the exterior [D][b]	Other requirements [Z][b]	Test temperature °C	Test duration
EC	Cosmetic products, e.g. creams	c	II, III	c	c	As agreed	RT	22 h
ED	Refreshment containing caffeine and sugar	c	III, IV	c	c	As agreed	RT	22 h
EE	Runway de-icer	I, II, IV	c	c	I, II, IV	As agreed	RT	2 h
EF	Cream, coffee whitener	c	III, IV	c	c	As agreed	RT	22 h
YY	Additional agents	c	c	c	c	As agreed	—	—

[a] See Table 2 for the preferred application method of agents (I, II, III, IV, V and VI).

[b] Depending on the mounting location, choose code A, B, C or D. Chemical loading can vary significantly depending on the type and use of the vehicle. For other requirements agreed between customer and supplier, choose code Z and mark all agents to be tested. Additional agents may be agreed between customer and supplier.

[c] Chemical agents are not applied.

[d] Test temperature: for maximum operating temperature, T_{max}, see ISO 16750-4.

Table 2 — Application methods

Code	Method
I	Spraying
II	Brushing
III	Wiping (e.g. cotton cloth)
IV	Pouring
V	Dipping
VI	Immersing

4.8 Procedure

The DUT shall be applied with the agent (see Table 3) in accordance with the application methods (see Table 2) at RT. The DUT shall then be stored in a suitable chamber at the temperature and for the duration specified in Table 1. If required, the DUT shall be cooled down to RT after storage and tested as specified below.

a) Perform a visual check and, if appropriate, a functional check and record data for comparison with post-test data.

b) Condition the DUT (see 4.4).

c) Place the DUT in its specified test setup. The configuration may include appropriate electrical or mechanical connections.

d) Stabilize the temperature of the specified agent(s) (see 4.5). Apply the specified agent(s) in accordance with Table 1 and 4.6 to the surface of the DUT that is likely to be exposed.

e) Allow the DUT to drain naturally. Shaking or wiping is not permitted. However, if representative of service conditions, it may be turned about any axis to allow for drainage from different positions.

f) Maintain the DUT at the temperature and for the duration specified in Table 1.

g) Stabilize the DUT at RT.

h) For more than 1 cycle, repeat steps d) to g).

i) Examine the DUT immediately in accordance with the requirements in 4.9.

Any safety and warning notes shall be observed.

4.9 Requirement

The minimum functional status shall be class C in accordance with ISO 16750-1. If necessary, other requirements shall be agreed between customer and supplier.

Marking and labelling shall remain visible and legible.

5 Documentation

For documentation, the designations outlined in ISO 16750-1 shall be used.

Table 3 — Chemical agents

Groups	ID	Chemical agents	Description of active substance[a]
Fuels	AA	Diesel fuel	See EN 590
	AB	"Bio" diesel	See EN 14214
	AC	Petrol/gasoline unleaded	See EN 228
	AD	Kerosene	See ASTM D 1655[b]
	AE	Methanol	CAS 67-56-1[c]
Oils and lubricants	BA	Engine oil	Multigrade oil (SAE 0W40[d], API SL/CF[e])
	BB	Differential oil	Hypoid gear oil (SAE 75W140, API GL-5)
	BC	Transmission fluid	ATF Dexron III
	BD	Hydraulic fluid	See DIN 51524-3 (HVLP ISO VG 46)
	BE	Greases	See DIN 51502 (KP2K-30)
	BF	Silicone oil	CAS 63148-58-3 (AP 100)
Other operating agents	CA	Battery fluid	37 % H_2SO_4
	CB	Brake fluid	See ISO 4926
	CC	Antifreeze fluid	Ethylene glycol ($C_2H_6O_2$) – Water mixture 1:1
	CD	Urea NO_x (reduction agent)[f]	See ISO 22241-1
	CE	Cavity protection	e.g. Teroson Underbody Coating Spray™[g]
	CF	Protective lacquer	e.g. W550™ (supplied by Pfinder Chemie)[g]
	CG	Protective lacquer remover	e.g. Friapol 750™ (supplied by Pfinder Chemie)[g]

Table 3 (*continued*)

Groups	ID	Chemical agents	Description of active substance[a]
Cleaning agents	DA	Windscreen washer fluid	5 % anionic tenside, deionized water
	DB	Vehicle washing chemicals	CAS 25155-30-0; CAS 9004-82-4
	DC	Interior cleaner	e.g. Motip Cockpit Spray™[g]
	DD	Glass cleaner	CAS 111-76-2
	DE	Wheel cleaner	e.g. Sonax Xtreme™[g]
	DF	Cold cleaning agent	e.g. P3-Solvclean AK™ (supplied by Henkel)[g]
	DG	Acetone	CAS 67-64-1
	DH	Cleaning solvent	See DIN 51635
	DJ	Ammonium-containing cleaner	e.g. Ajax™ (supplied by Henkel)[g]
	DK	Denatured alcohol	CAS 64-17-5 (ethanol)
Other agents	EA	Contact spray	e.g. WD 40™[g]
	EB	Transpiration	See DIN 53160
	EC	Cosmetic products such as creams	e.g. Nivea™, Kenzo™[g]
	ED	Refreshment containing caffeine and sugar	Cola
	EE	Runway de-icer	SAE AMS 1435A
	EF	Cream (condensed milk), coffee whitener	Cream[g]
	YY	Additional agents	[g]

[a] Suppliers or trade marks are given for certain chemical agents in this table. These products are examples of suitable products available commercially. This information is given for the convenience of users of this part of ISO 16750 and does not constitute an endorsement by ISO of these products.

[b] ASTM: American Society for Testing and Materials.

[c] CAS: Chemical Abstract Service.

[d] SAE: Society of American Engineers.

[e] API: American Petroleum Institute.

[f] Also known as “ad blue”.

[g] The referenced agent can be used or an agent shall be agreed between customer and supplier.

Bibliography

[1] ISO 4926, *Road vehicles — Hydraulic braking systems — Non-petroleum-base reference fluids*

[2] ISO 22241-1, *Diesel engines — NOx reduction agent AUS 32 — Part 1: Quality requirements*

[3] EN 228, *Automotive fuels — Unleaded petrol — Requirements and test methods*

[4] EN 590, *Automotive fuels — Diesel — Requirements and test methods*

[5] EN 14214, *Automotive fuels — Fatty acid methyl esters (FAME) for diesel engines — Requirements and test methods*

[6] ASTM D 1655, *Standard specification for aviation turbine fuels*

[7] DIN 51502, *Designation of lubricants and marking of lubricant containers, equipment and lubricating points*

[8] DIN 51524-3, *Pressure fluids — Hydraulic oils — Part 3: HVLP hydraulic oils; Minimum requirements*

[9] DIN 51635, *Mineral spirits — FAM standard mineral spirit — Requirements*

[10] DIN 53160, *Determination of the colourfastness of articles in common use*

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