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Road vehicles — Dimethyl ether (DME) fuel system components —

Part 4: Level indicator

Véhicules routiers — Composants des systèmes de combustible Diméthyle Ether (DME) —

Partie 4: Indicateur de niveau

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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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 document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 41, *Specific aspects for gaseous fuels*.

A list of all parts in the ISO 22760 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Road vehicles — Dimethyl ether (DME) fuel system components —

Part 4: Level indicator

1 Scope

This document specifies definitions of and general requirements to level indicators, intended for use on the types of motor vehicles defined in ISO 3833. It also provides general design principles, and specifies requirements for instructions and marking.

This document is applicable to vehicles using gaseous fuels in accordance with ISO 16861. It is not applicable to the following:

a) fuel containers, except to the extent explicitly referred to in this document;

b) stationary, ship, railroad vehicle or aircraft dimethyl ether (DME) engine installations;

c) electronic fuel management;

d) refuelling receptacles.

NOTE 1 It is recognized that miscellaneous component properties not specifically addressed herein can be examined for compliance with the criteria of any applicable part of the ISO 22760 series, including subjecting the component to the appropriate functional tests.

NOTE 2 All pressures referred to in this document are gauge pressures unless otherwise specified.

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 22760-1, *Road vehicles — Dimethyl ether (DME) fuel system components — Part 1: General requirements and definitions*

ISO 22760-2, *Road vehicles — Dimethyl ether (DME) fuel system components — Part 2: Performance and general test methods*

IEC 60529:1989+A1:1999, *Degrees of protection provided by enclosures (IP Code)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 22760-1 apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Marking

Marking of the component shall provide sufficient information to allow the following to be traced:

a) the manufacturer's or agent's name, trademark or symbol;

b) the model designation (part number);

c) the working pressure or working pressure and temperature range.

The following additional marking entries are recommended:

— the direction of flow (when necessary for correct installation);

— the type of fuel;

— the electrical rating (if applicable);

— the symbol of the certification agency;

— the type approval number;

— the serial number or date code;

— a reference to this document.

NOTE This information can be provided by a suitable identification code on at least one part of the component when it consists of more than one part.

5 Design and assembly

The level indicator shall comply with the applicable provisions of ISO 22760-1 and ISO 22760-2 and pass the tests specified in Clause 6.

The electrical connections shall be of IP54 specifications according to IEC 60529-1989+A1:1999.

The accuracy of level sensing by the level indicator in a given vehicle is up to the vehicle's manufacturer to provide, with one exception: its accuracy shall be sufficient to ensure that the 85 % stop valve satisfies requirements to the accuracy of the point of transition of the 85 % stop valve from the open to the cut-off position (see ISO 22760-3:2024, Clause 5).

The requirements according to these exceptions cannot usually be satisfied by the level indicator alone, as the indicator's accuracy is dependent on its relative position with the fuel container and other factors. Hereby, attention is drawn to the importance of other standards containing requirements to the complete system assemblies where level indicators are used.

6 Tests

6.1 Applicability

The required tests are indicated in Table 1.

Table 1 — Applicable tests

Test	Applicable	Test procedure as required by ISO 22760-2	Specific test requirements of this document
Hydrostatic strength	X	X	X (See 6.2)
Leakage	X	X	X (See 6.3)
Excess torque resistance	X	X	
Bending moment	X	X	
Continued operation	X	X	X (See 6.4)
Corrosion resistance	X [b]	X	
Electrical over-voltage	X [a]	X [a]	
Insulation resistance	X [a]		X (See 6.5)
Vibration resistance	X	X	
Brass material compatibility	X	X	
Oxygen ageing	X	X	
Non-metallic material immersion	X	X	
Ozone ageing	X	X	
Resistance to dry heat	X	X	
Creep	X	X	
Temperature cycle test	X	X	
Float pressure test	X		X (See 6.6)

[a] Only applicable for level indicators having electrical connections.

[b] Only applicable for level indicators exposed to environmental conditions.

6.2 Hydrostatic strength

Test the level indicator according to the procedure for testing hydrostatic strength specified in ISO 22760-2. The test pressure shall be 2,25 times the working pressure.

6.3 Leakage

Test the level indicator at the temperatures and pressures given in Table 2.

Table 2 — Test temperatures and pressures

Temperature °C (±5 °C)	Pressure Factor × working pressure (WP)	
	First test	Second test
−40 or −20	0,75 × WP	0,025 × WP
20	0,025 × WP	2,25 × WP
85	0,05 × WP	

6.4 Continued operation

The most important system safety-related function of the level indicator is to provide accurate enough information to the relevant other system components such that the system never permits the level of liquid fuel in the tank to exceed the maximum allowed (see ISO 22760-3:2024, Clause 5) during the entire lifetime of the system and/or of the level indicator. Therefore, all other necessary components that form, in assembly with the level indicator, the system responsible for fulfilling this requirement, shall be utilized to carry

out the continued operation test. The level indicator, in such an assembly, shall be tested according to the following procedure:

a) Install and connect the level indicator according to its normal position and function in the intended system.

b) Fill the container/test setup with DME until the 85 % stop valve switches from the open position to the cut-off position.

c) Verify that the fuel level in the container is according to specification (see ISO 22760-3:2024, Clause 5). Note the reading of the level indicator.

d) Remove the level indicator from the test system and subject it to all other applicable non-destructive tests as per Table 1.

e) Place the level indicator in an environment representative of the inside of a fuel container filled with DME and cycle the indicator 4 000 000 times between ±10 % positions around the reading noted in step c) at a frequency greater than 2 Hz.

f) Repeat steps a), b) and c).

g) Cycle the level indicator 6 000 times between positions representing an empty tank and the one above that characterized by the reading noted in step c). Then, empty the tank below 50 %.

h) Repeat the steps b) and c).

All parts shall remain in position and function properly after this test. Failure in any sense during the procedure shall constitute a failure of the level indicator.

Following this test, the level indicator shall comply with the hydrostatic strength test according to 6.2.

6.5 Insulation resistance

The insulation resistance test is designed to verify the quality of electrical insulation of the signal connections of the level indicator.

Apply a DC source at 1 000 V between each one of the connector pins alternately and the housing of the level indicator for at least 2 s. The measured resistance shall be higher than the minimum allowable 240 kΩ.

The indicator does not have to be assembled with the fuel container during the test.

6.6 Float pressure test

If the level indicator comprises a float, the latter shall withstand an outside pressure of 4 500 kPa. Test as follows:

— place the valve and float assembly in a suitable pressure vessel;

— apply pressure of 4 500 kPa, hold the pressure for 1 min;

— remove the valve, check for deformation.

The indicator does not have to be assembled with the fuel container during the test.

Acceptance criteria: no visible deformation nor cracking is allowed.