
Ships and marine technology — Ventilation of cargo spaces where vehicles with internal combustion engines are driven — Calculation of theoretical total airflow required

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Navires et technologie maritime — Ventilation des espaces cargaison des navires dans lesquels des véhicules à moteur à combustion interne sont utilisés — Calcul du débit d'air total théorique exigé

ISO 9785:2002

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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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 9785 was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 3, *Piping and machinery*.

This second edition cancels and replaces the first edition (ISO 9785:1990), which was revised for continued consistency with International Marine Organization provisions for calculating required ventilation in cargo spaces where vehicles with internal combustion engines may be driven.

Annex A forms a normative part of this International Standard. Annex B is for information only.

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Introduction

The purpose of this International Standard is to ensure that exposure to substances hazardous to health should be kept as low as is reasonably practicable in work areas in cargo spaces in ships. This can, as a rule, be achieved by limiting exhaust gas emissions as far as possible (by controlling the traffic) and by providing a high flow of air in the cargo spaces. For further information and guidance regarding good practice, please refer to recent guidelines developed by the International Maritime Organization which are contained in the IMO Maritime Safety Committee Circular 729 (MSC Circ. 729), *Guidelines and Operational Recommendations for Ventilation Systems in RO-RO Cargo Spaces*.

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1 Scope

This International Standard specifies methods of calculating the theoretical quantity of outdoor air required in cargo spaces of ships where vehicles with internal combustion engines are driven, in order to dilute the polluted air to within the permitted occupational exposure limits.

Annex A specifies average values of the amounts of pollutants in exhaust gases from vehicles with internal combustion engines driven in cargo spaces in ships.

Annex B gives general information and guidance as to good practice for the ventilation of cargo spaces in ships where vehicles with internal combustion engines may be driven.

Users of this International Standard should note that, while observing the requirements of the standard, they should at the same time ensure compliance with such statutory requirements, rules, and regulations as may be applicable to the individual ship concerned. Users should also refer to guidelines developed by the International Maritime Organization (IMO) contained in the Maritime Safety Committee Circular 729 (MSC Circ. 729), *Guidelines and Recommendations for Ventilation systems in RO-RO Cargo Spaces*.

2 Terms and definitions

[ISO 9785:2002](https://standards.iteh.ai/catalog/standards/sist/b8157f71-1105-4520-ab3c-4305a5e33c57/iso-9785-2002)

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For the purposes of this International Standard, the following terms and definitions apply.

2.1

cargo space

space used for cargo where vehicles may be driven

2.2

occupational exposure limit

highest airborne concentrations averaged over a specified period of time (time-weighted average or TWA) of substances hazardous to health for employees at work

NOTE An occupational exposure limit refers either to a long-term exposure limit or to a short-term exposure limit as determined by the appropriate authority.

2.3

working area

area occupied by employees at work

3 Airflow calculation

3.1 Volume of space

The volume of total cargo spaces shall be the gross volume with no deduction for the cargoes or for frames, webs, pillars, ducts, etc. In the case of lining or insulation of cargo spaces, the volume shall be calculated from the inside of the lining or insulation.

3.2 Supply airflow

3.2.1 General

The outdoor-supply airflow to the cargo spaces shall be calculated using whichever of the following criteria gives the highest value:

- minimum number of air changes according to applicable statutory requirements;
- required outdoor-supply airflow to maintain the occupational-exposure limit-value.

3.2.2 Supply airflow to maintain the occupational-exposure-limit value

3.2.2.1 Introduction

The sum of the required outdoor-supply airflows per vehicle in operation to maintain the occupational-exposure-limit value is calculated in accordance with 3.2.2.2 or 3.2.2.3 for normally polluted outdoor air or highly polluted outdoor air, respectively.

3.2.2.2 Normally polluted outdoor air

The required outdoor-supply airflow, q_p , per vehicle in operation for normally polluted outdoor air, in cubic metres per second (m^3/s), is given by the equation

$$q_p = \frac{q_m}{ac}$$

where

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q_m is the pollution per vehicle in operation, in milligrams per second (see clause 4);

a is the factor of dilution (see clause 5);

c is the occupational-exposure-limit value, in milligrams per cubic metre.

(See typical examples of application in B.2.)

NOTE The pollution contents of normally polluted outdoor air can be taken to be less than 1/40 of the occupational-exposure-limit value.

3.2.2.3 Highly polluted outdoor air

The required outdoor-supply airflow, q_p , per vehicle in operation for highly polluted outdoor air, in cubic metres per second, is given by the equation:

$$q_p = \frac{q_m}{a(c - c')}$$

where

q_m , a and c are as defined in 3.2.2.2;

c' is the content of the pollutant in question in outdoor air, in milligrams per cubic metre.

4 Pollution from vehicles

The purchaser shall specify the type of engine in the vehicles, the engine size, operation cycles (activity on board) and the anticipated number of vehicles normally in operation simultaneously in each working area.

Where specific data on the amount of pollutants (substances hazardous to health) generated by these vehicles are not available, the data according to A.1 shall be used. If the operation cycles are not the same as in A.1, quantities calculated according to A.2 shall apply.

5 Factors of dilution

The factor of dilution indicates the degree of estimated or possible dilution of the air pollution in the cargo spaces.

The purchaser shall specify the factor of dilution taking into account any legal requirements. In the absence of such a specification, the following factors shall apply:

- 0,8 in general cargo spaces;
- 0,4 in cargo spaces in car carriers;
- 0,8 in cargo spaces in ferries with a ventilation system in which the air is supplied at one end and exhausted at the opposite end of the space.

NOTE Guidelines for factors of dilution are given in B.4.

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