

SLOVENSKI STANDARD

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Ohlajena utekočinjena plinasta goriva naftnega in nenaftnega izvora - Kalibracija membranskih rezervoarjev in samostojnih prizmatičnih rezervoarjev na ladjah - Ročne in notranje električno-optične distančne meritvene metode (ISO 8311:2013)

Refrigerated hydrocarbon and non-petroleum based liquefied gaseous fuels - Calibration of membrane tanks and independent prismatic tanks in ships - Manual and internal electro-optical distance-ranging methods (ISO 8311:2013)

Gekühlte Kohlenwasserstoffe und verflüssigte, nicht auf Erdöl basierende gasförmige Brennstoffe - Kalibrierung von Membrantanks und unabhängigen Prismentanks in Schiffen - Manuelle Messung und Innenmessung nach dem elektrooptischen Distanzmessverfahren (ISO 8311:2013)

Hydrocarbures réfrigérés et combustibles gazeux liquéfiés à base non pétrolière - Étalonnage des réservoirs à membrane et réservoirs pyramidaux - Méthodes manuelles et par mesurage électro-optique interne de la distance (ISO 8311:2013)

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ICS:

47.020.85	Prostori za tovor	Cargo spaces
75.180.30	Oprema za merjenje prostornine in merjenje	Volumetric equipment and measurements

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EUROPEAN STANDARD

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Refrigerated hydrocarbon and non-petroleum based liquefied
gaseous fuels - Calibration of membrane tanks and independent
prismatic tanks in ships - Manual and internal electro-optical
distance-ranging methods (ISO 8311:2013)

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Membrantanks und unabhängigen Prismentanks in Schiffen
- Manuelle Messung und Innenmessung nach dem
elektrooptischen Distanzmessverfahren (ISO 8311:2013)

This European Standard was approved by CEN on 9 November 2013.

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN ISO 8311:2013) has been prepared by Technical Committee ISO/TC 28 “Petroleum products and lubricants” in collaboration with Technical Committee CEN/TC 19 “Gaseous and liquid fuels, lubricants and related products of petroleum, synthetic and biological origin” the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2014, and conflicting national standards shall be withdrawn at the latest by June 2014.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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INTERNATIONAL
STANDARD

ISO
8311

Second edition
2013-12-01

**Refrigerated hydrocarbon and non-
petroleum based liquefied gaseous
fuels — Calibration of membrane tanks
and independent prismatic tanks in
ships — Manual and internal electro-
optical distance-ranging methods**

iTeh STANDARD PREVIEW

*Hydrocarbures réfrigérés et combustibles gazeux liquéfiés à base non
pétrolière — Étalonnage des réservoirs à membrane et réservoirs
pyramidaux — Méthodes manuelles et par mesurage électro-optique
interne de la distance*

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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.

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

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received. www.iso.org/patents

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 28, *Petroleum products and lubricants*, Subcommittee SC 5, *Measurement of refrigerated hydrocarbon and non-petroleum based liquefied gaseous fuels*.

This second edition cancels and replaces the first edition (ISO 8311:1989), which has been

Introduction

Large quantities of light hydrocarbons consisting of compounds having one to four carbon atoms are stored and transported by sea as refrigerated liquids at pressures close to atmospheric. These liquids can be divided into two main groups, liquefied natural gas (LNG) and liquefied petroleum gas (LPG). Bulk transportation of these liquids requires special technology in ship design and construction to enable ship-borne transportation to be safe and economical.

Quantification of these cargoes in ships' tanks for custody transfer purposes has to be of a high order of accuracy. This International Standard (together with others in the group) specifies methods of internal measurement of ships' tanks, from which tank capacity tables can be derived.

This International Standard covers calibration techniques applicable to membrane type tanks, i.e. self-supporting independent tanks in which the containment system comprises a relatively thin membrane of either stainless steel or high-nickel steel alloy. This International Standard, with some modification, can also be applicable to the calibration of independent prismatic tanks.

[Annex A](#) gives uncertainty associated with the measurement of membrane tanks.

[Annex B](#) gives an example of a tank capacity table relating partial filling volume as a function of liquid level and [Annexes C](#) and [D](#) give examples of trim correction and list correction tables, respectively.

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Refrigerated hydrocarbon and non-petroleum based liquefied gaseous fuels — Calibration of membrane tanks and independent prismatic tanks in ships — Manual and internal electro-optical distance-ranging methods

1 Scope

This International Standard specifies a method for the internal measurement of membrane tanks used in ships for the transport of refrigerated light hydrocarbon fluids. In addition to the actual process of measurement, it sets out the calculation procedures for compiling the tank capacity table and correction tables to be used for the computation of cargo quantities. This International Standard, with some modification, can also be applicable to the calibration of independent prismatic tanks.

For the manual measurement of membrane tanks, the procedures of this International Standard utilize the scaffolding used for the installation of the membranes to support the measuring equipment but, for the internal electro-optical distance-ranging (EODR) method, other safe means of access to the required measuring positions are intended to be used.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 7507-1:2003, *Petroleum and liquid petroleum products — Calibration of vertical cylindrical tanks — Part 1: Strapping method*

ISO 7507-4:2010, *Petroleum and liquid petroleum products — Calibration of vertical cylindrical tanks — Part 4: Internal electro-optical distance-ranging method*

IEC 60079-10-1, *Explosive atmospheres — Part 10-1: Classification of areas — Explosive gas atmospheres*

IEC 60079-10-2, *Explosive atmospheres — Part 10-2: Classification of areas — Combustible dust atmospheres*

IEC 60825-1, *Safety of laser products — Part 1: Equipment classification and requirements*

3 Terms and definitions

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

3.1

automatic tank gauge

ATG

automatic level gauge

ALG

instrument that continuously measures liquid height (dip or ullage) in storage tanks

3.2

chamfer

slanting surface connecting the walls of a tank with its top or bottom surface

ISO 8311:2013(E)**3.3****deadwood**

any tank fitting that affects the capacity of a tank

3.4**gauge reference point**

point from which the liquid depth are measured

3.5**horizontal plane**

any plane established parallel to the tank bottom

3.6**horizontal reference line**

any horizontal line established by a string

Note 1 to entry: A calibration method using this line is adopted as an alternative to direct measurements, where it is considered impractical to take direct measurements.

3.7**list**

transverse inclination of a ship

Note 1 to entry: It is expressed in degrees.

3.8**longitudinal line**

line formed by a longitudinal plane crossing a horizontal plane

3.9**longitudinal plane**

vertical plane running parallel to the centreline of the tank

3.10**measuring point**

one of a series of points on the inside surface of the tank shell from/to which the distance is measured by a tape or a hand-held laser distance meter in case of manual method, or to which the slope distance, vertical angles and horizontal angles are measured by use of the electro-optical distance-ranging instrument

3.11**port**

left-hand side of a ship facing forward

3.12**reference target point**

fixed point clearly marked on the inside surface to the tank shell or a prism mounted on a tripod

3.13**section line**

line formed by a section plane crossing a horizontal plane

3.14**section plane**

plane parallel with the fore and aft end walls of a ship's tank

3.15**slope distance**

distance measured from the electro-optical distance-ranging instrument to any measuring point or a reference target point

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3.16**starboard**

right-hand side of a ship facing forward

3.17**tank-calibration reference temperature**

temperature at which the calibration of a tank has been calculated

3.18**tank capacity table**

tank table

calibration table

capacity table

table showing the capacities of, or volumes in, a tank corresponding to various liquid levels measured from a reference point

3.19**trim**

difference between the fore and aft draught of the vessel

Note 1 to entry: When the aft draught is greater than the forward draught, the vessel is said to be trimmed by the stern. When the aft draught is less than the forward draught, the vessel is said to be trimmed by the head.

3.20**uncertainty**

U_C

estimate characterizing the range of values within which the true value of a measurand lies

Note 1 to entry: Various types of uncertainty are defined in ISO/IEC Guide 98-3.

3.21**vertical line**

line formed by a section plane on the side walls and formed by a longitudinal plane on the fore and aft end walls

4 Precautions**4.1 General**

This clause outlines the precautions to be taken during measurement. Utmost care and attention shall be exercised in taking measurements, and any unusual occurrence during the measuring work, which might affect the results, shall be recorded.

4.2 Ship's condition during calibration

The calibration methods described in this International Standard may be applied to ships whether afloat or in a dry dock. However, its use for ships in a dry dock is preferred, because trim or list, if any, will remain the same throughout the calibration procedure. Adjustments, manually or automatically shall be made to any measurement by optical level and EODR if the ship's attitude has changed.

4.3 Tank distortion

If unusual distortion is found in the tank, additional measurement shall be taken by the calibrator as considered necessary and sufficient. Notes by the calibrator detailing the extra measurements and the reasons for them shall be included in the calibration report.

The calibrator shall provide detailed sketches of any abnormality of the tank or its fittings where such sketches can materially assist the interpretation of the recorded data.