BS ISO 18132-1:2011

BSI Standards Publication

Refrigerated hydrocarbon and non-petroleum based liquefied gaseous fuels — General requirements for automatic tank gauges

Part 1: Automatic tank gauges for liquefied natural gas on board marine carriers and floating storage

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National foreword

This British Standard is the UK implementation of ISO 18132-1:2011. Together with BS ISO 18132-3:2011, it supersedes BS ISO 18132-1:2006, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PTI/12, Petroleum Measurement and Sampling.

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This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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INTERNATIONAL STANDARD

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Refrigerated hydrocarbon and non-petroleum based liquefied gaseous fuels — General requirements for automatic tank gauges —

Part 1: Automatic tank gauges for liquefied natural gas on board marine carriers and floating storage

Hydrocarbures réfrigérés et combustibles gazeux liquéfiés à base non pétrolière — Exigences générales pour jauges de réservoir automatiques —

Partie 1: Jauges de réservoir automatiques pour gaz naturel liquéfié à bord des transporteurs de cargaison en mer et des stocks flottants

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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 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 18132-1 was prepared by Technical Committee ISO/TC 28, *Petroleum products and lubricants*, Subcommittee SC 5, *Measurement of refrigerated hydrocarbon and non-petroleum based liquefied gaseous fuels*.

This second edition of ISO 18132-1, together with ISO 18132-3:2011, cancels and replaces ISO 18132-1:2006, which has been technically revised.

ISO 18132 consists of the following parts, under the general title *Refrigerated hydrocarbon and non-petroleum based liquefied gaseous fuels — General requirements for automatic tank gauges*:

— *Part 1: Automatic tank gauges for liquefied natural gas on board marine carriers and floating storage*

— *Part 2: Gauges in refrigerated-type shore tanks*

— *Part 3: Automatic tank gauges for liquefied petroleum and chemical gases on board marine carriers and floating storage*

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Introduction

Large quantities of liquefied natural gas (LNG) are transported by LNG carriers and traded by static measurement of the cargo on board by automatic tank measurement. The LNG automatic tank measurement by a custody transfer measurement system (CTMS) involves determination of liquid/vapour interface, i.e. liquid level, average temperatures of liquid and vapour, and vapour pressure. The volumetric quantity of the LNG transferred is calculated with the tank capacity table. The transferred energy content is determined on the basis of this volume, along with the density and heating value of LNG derived from chemical composition of the representative samples.

To ensure accurate quantitative determination of LNG, custody transfer measurement usually takes place on board the LNG carrier and floating storage, not at the shore tanks. Liquid level expressed in innage or ullage is one of the important measurement parameters needed to accurately determine the LNG cargo on board.

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Refrigerated hydrocarbon and non-petroleum based liquefied gaseous fuels — General requirements for automatic tank gauges —

Part 1:
Automatic tank gauges for liquefied natural gas on board marine carriers and floating storage

1 Scope

This part of ISO 18132 establishes general principles for the accuracy, installation, calibration and verification of automatic tank gauges (ATGs) used for custody transfer measurement of liquefied natural gas (LNG) on board an LNG carrier or floating storage.

The LNG described in this part of ISO 18132 is either fully refrigerated (i.e. at the cryogenic condition), or partially refrigerated, and therefore the fluid is at or near atmospheric pressure.

This part of ISO 18132 also specifies the technical requirements for data collection, transmission and reception. Specific technical requirements for various automatic tank gauges and accuracy limitations are given in the annexes.

2 Terms, definitions and abbreviated terms

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

2.1 Terms and definitions

2.1.1
automatic tank gauge
ATG
instrument that continuously measures liquid height (dip or ullage) in storage tanks

NOTE 1 An automatic tank gauge usually includes a level sensor, a gauge head and associated mounting hardware, and in some cases local display.

NOTE 2 Automatic tank gauges are also known as automatic level gauges (ALGs).

2.1.2
automatic tank gauging system
ATG system
system that includes ATGs at the cargo tanks and control/display unit that processes and displays output signals from the ATG along with any other parameters required to determine the liquid level, i.e. liquid/vapour interface

NOTE The ATG system can also compute the volume of LNG in tanks, using the values of cargo tank temperature and pressure, draft, and tank capacity table.

2.1.3
capacitance-type ATG
ATG that uses electrodes, i.e. coaxial aluminium tubes, vertically assembled in the cargo tanks to detect the dielectric constant of LNG, thereby determining the liquid level

NOTE See Annex C for further descriptions.

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2.1.4
custody transfer measurement system
CTMS
system that processes inputs from an ATG system, thermometers, pressure gauges, etc., and provides custody transfer measurement information on board, generating documents with regard to custody transfer of LNG

NOTE The ATG system can be incorporated as part of a CTMS.

2.1.5
float-type ATG
ATG that uses a float to detect the liquid level

NOTE The float is guided by a tape or wire that is connected to a drum or a ratchet in the gauge head, where the level measured is displayed locally and/or remotely. See Annex D for more descriptions.

2.1.6
intrinsic error
inherent error
error of an ATG when it is tested against a reference standard under controlled conditions as specified by the manufacturer

2.1.7
radar-type ATG
microwave-type ATG
ATG that utilizes an antenna to transmit electromagnetic continuous waves toward the liquid in a tank, and to receive electromagnetic waves which are reflected at the surface of the liquid

NOTE See Annex B for further descriptions.

2.2 Abbreviated terms

ATG automatic tank gauge

CTMS custody transfer measurement system

EMC electromagnetic compatibility

FPSO floating production, storage and offloading

FSO floating storage and offloading

IACS international association of classification societies

LNG liquefied natural gas

LPG liquefied petroleum gas

3 General safety precautions

3.1 Compliance with safety regulations, standards, and classification rules

This part of ISO 18132 may involve hazardous materials, operations, and equipment. This part of ISO 18132 does not purport to supersede any safety or operating practices recommended by applicable regulatory agencies and organizations. It is the responsibility of the user of this part of ISO 18132 to establish appropriate health and safety practices and determine the applicability of regulatory limitations prior to use.

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3.2 Equipment precautions

3.2.1 General

All electric components of an ATG for use in electrically classified areas shall meet the electrical area classification (see IEC 60079-0). They shall conform to applicable sections of the national and/or international electrical safety standards. All ATGs shall be maintained in safe operating condition and manufacturers' maintenance instructions should be complied with.

3.2.2 Mechanical rigidity

All ATGs shall be capable of withstanding the pressure, temperature, operating, and environmental conditions likely to be encountered in the service.

Where an ATG is installed near a submerged pump or the end of a loading/unloading line in a cargo tank, appropriate measures shall be applied to prevent the ATG from being affected by the vortex or vaporization (i.e. boiling) of cargo caused by the cargo loading or cargo unloading operations.

3.2.3 Gastight design

ATGs shall be designed such that the tank penetration for the ATG is of gastight construction in order to minimize the escape of vapour from the cargo tank. The gauge head or transmitter located on the deck shall be so constructed as to minimize leakage of vapour from the tank.

3.2.4 Compatibility with cargo

All parts of the ATG in contact with the LNG or its vapour shall be chemically compatible with the product, to avoid both product contamination and corrosion of the ATG.

3.2.5 Tolerance against low temperatures

ATGs shall be designed to withstand the low-temperature thermal contraction of their components and of the tanks. Additionally, level measurement errors caused by such thermal contraction shall be compensated for in an appropriate manner.

3.2.6 Type approval

The design and installation of ATGs shall be subject to type approval. Type approval is normally issued after an ATG has been subjected to a specific series of tests.

NOTE Type approval is normally performed by a national measurement organization or class society for environmental considerations (see IACS Unified Requirements E 10).

3.2.7 Use of an ATG in custody transfer service

ATGs, including those which use measurement technologies not listed in this part of ISO 18132, are considered acceptable for use in LNG custody transfer service if they are judged to be compatible with those ATGs in this part of ISO 18132 by the parties to the sales contract of LNG, and approval by national regulations.

4 Design requirements

4.1 General

The following design requirements apply to all types of ATGs on LNG carriers, FPSOs and FSOs. These requirements, which may be in addition to the technical specifications by the ATG manufacturer, should be met where they are applicable.

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