
**Petroleum and liquid petroleum products —
Measurement of level and temperature in
storage tanks by automatic methods —**

**Part 2:
Measurement of level in marine vessels**

STANDARD PREVIEW

*Pétrole et produits pétroliers liquides — Mesurage du niveau et de la
température dans les réservoirs de stockage par des méthodes
automatiques —*

Partie 2: Mesurage du niveau dans les citernes de navire

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Contents

	Page
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Precautions	2
4.1 Safety precautions	2
4.1.1 General	2
4.1.2 Equipment precautions	2
4.2 General precautions	3
4.2.1 Accuracy and performance	3
4.2.2 Speed of response	3
4.2.3 Protection from mechanical damage	3
4.2.4 Manual gauging	3
4.2.5 Minimum measurable level	3
4.2.6 Trim and list	3
4.2.7 Product temperatures	3
4.2.8 Compatibility	3
4.2.9 Entrained air and vapour	4
4.2.10 Vessel motion	4
4.3 Use of marine ALGs in fiscal/custody transfer	4
5 Accuracy	4
5.1 Intrinsic error of ALGs	4
5.2 Calibration prior to installation	4
5.3 Initial shipyard adjustment	4
5.4 Error caused by operating conditions	5
5.5 Overall accuracy	5
5.5.1 General	5
5.5.2 Use of ALGs for fiscal/custody transfer purposes	5
6 Installation of marine ALGs	5
6.1 General	5
6.2 Location of ALG	5
6.3 Location of manual calibration check point	5
6.4 Gauging of inerted tanks	5
7 Onboard verification of marine ALGs	6
7.1 General precautions	6
7.1.1 Check for smooth operation of level-sensing elements — at the shipyard	6
7.1.2 ALG technology-specific considerations	6
7.2 Verification by innage gauging or ullage gauging	6
7.3 Initial verification	6

7.4	Subsequent verification	6
7.4.1	General	6
7.4.2	Agreement between ALG reading and manual gauge reading	6
7.4.3	Use of average gauge readings	6
7.4.4	Adjustment of the ALG	7
7.5	Verification by alternate methods	7
7.6	Schedule for regular ALG verification	7
7.7	Record keeping	7
8	Data communication and receiving	7
8.1	Introduction	7
8.2	Use of remote readout in fiscal/custody transfer	7
8.3	Telemetry and readout equipment	8

Annexes

A	Accuracy limitations of marine level measurement	9
B	Accuracy limitations of marine volume measurement.....	10
	Bibliography.....	11

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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 part of ISO 4266 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 4266-2 was prepared by Technical Committee ISO/TC 28, *Petroleum products and lubricants*, Subcommittee SC 3, *Static petroleum measurement*.

ISO 4266-2, together with ISO 4266-1 and ISO 4266-3 to ISO 4266-6, cancels and replaces ISO 4266:1994, which has been technically revised.

ISO 4266 consists of the following parts, under the general title *Petroleum and liquid petroleum products — Measurement of level and temperature in storage tanks by automatic methods*:

- *Part 1: Measurement of level in atmospheric tanks*
- *Part 2: Measurement of level in marine vessels*
- *Part 3: Measurement of level in pressurized storage tanks (non-refrigerated)*
- *Part 4: Measurement of temperature in atmospheric tanks*
- *Part 5: Measurement of temperature in marine vessels*
- *Part 6: Measurement of temperature in pressurized storage tanks (non-refrigerated)*

Annexes A and B of this part of ISO 4266 are for information only.

Introduction

Marine ALGs are not normally used in fiscal/custody transfer applications because of the limitations described in annexes A and B. However, level measurement by marine ALGs may be used in fiscal/custody transfer when no other alternative, reliable measurement is available. The use of marine-vessel-based ALGs in fiscal/custody transfer normally requires mutual contractual agreement between the buyer and the seller and may be subject to government regulations.

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Petroleum and liquid petroleum products — Measurement of level and temperature in storage tanks by automatic methods —

Part 2:

Measurement of level in marine vessels

1 Scope

This part of ISO 4266 gives guidance on the accuracy, installation, calibration and verification of automatic level gauges (ALGs), both intrusive and non-intrusive, for measuring the level of petroleum and liquid petroleum products having a Reid vapour pressure less than 100 kPa, transported aboard marine vessels (i.e. tankers and barges).

This part of ISO 4266 gives guidance for buyers and sellers who mutually agree to use marine ALGs for either fiscal and/or custody transfer applications.

This part of ISO 4266 is not applicable to the measurement of level in refrigerated cargo tanks.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 4266. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 4266 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 1998 (all parts), *Petroleum industry — Terminology*

ISO 4512:2000, *Petroleum and liquid petroleum products — Equipment for measurement of liquid levels in storage tanks — Manual methods*

ISO 8697:1999, *Crude petroleum and petroleum products — Transfer accountability — Assessment of on board quantity (OBQ) and quantity remaining on board (ROB)*

3 Terms and definitions

For the purposes of this part of ISO 4266, the terms and definitions given in ISO 1998, and the following, apply.

3.1

automatic level gauge

ALG

automatic tank gauge

ATG

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

3.2

dip

innage

vertical distance between the dipping datum point and the liquid level

3.3

innage-based ALGs

ALGs designed and installed to measure the liquid dip directly

3.4

still-pipe

vertical, perforated pipe built into a tank to contain the liquid-level-detecting element in order to reduce measurement errors arising from liquid turbulence, surface flow or agitation of the liquid, and to provide a stable mounting point for an ALG

3.5

ullage

outage

distance between the liquid level and the upper reference point, measured along the vertical measurement axis

3.6

ullage-based ALGs

ALGs designed and installed to measure the distance from the ALG reference point to the liquid surface

4 Precautions

4.1 Safety precautions

4.1.1 General

International Standards and government regulations, classification societies and ISGOTT on safety and material-compatibility precautions should be followed when using marine ALG equipment. In addition, the manufacturers' recommendations on the use and installation of the equipment should be followed.

4.1.2 Equipment precautions

4.1.2.1 All marine ALGs should be capable of withstanding the pressure, temperature and other environmental conditions likely to be encountered in marine service. When an ALG is installed in a corrosive service, any parts exposed to the liquid or vapours should be of durable, corrosion-resistant construction.

4.1.2.2 All ALGs should be sealed to withstand the vapour pressure of liquid in the tank. ALGs mounted on vessels with an inert gas system (IGS) should be designed to withstand the operating pressure of the IGS.

4.1.2.3 All marine ALGs should be specified and installed in accordance with the appropriate national and/or international (IMO, IEC, CENELEC, ISGOTT, ISO, etc.) marine electrical safety standards. ALGs should be certified for use in the hazardous-area classification appropriate to their installation.

All ALG equipment should be maintained in safe operating condition and the manufacturers' maintenance instructions should be complied with.

NOTE 1 The design and installation of ALGs may be subject to the approval of the national measurement organization and classification societies, who may have issued a general type approval for the design of the ALG for the particular service for which it is to be employed. Type approval is normally issued after an ALG has been subjected to a specific series of tests and is subject to the ALG being installed in an approved manner.

NOTE 2 Type-approval tests may include the following: visual inspection, performance, vibration, humidity, dry heat, inclination, fluctuations in power supplies, insulation, resistance, electromagnetic compatibility, and high voltage.

4.1.2.4 The ALGs should provide security to prevent unauthorized adjustment or tampering. For ALGs to be used in fiscal/custody transfer application, the ALG should provide facilities to allow sealing of the calibration adjustment.

4.2 General precautions

4.2.1 Accuracy and performance

The general precautions given in 4.2.2 to 4.2.10 affect the accuracy and performance of all types of marine ALGs and should be observed where they are applicable.

4.2.2 Speed of response

Marine ALGs should have sufficient dynamic response to track the liquid level during maximum tank filling or emptying rates.

4.2.3 Protection from mechanical damage

Marine ALGs should be designed to withstand damage caused by waves in the tanks due to ship movement. They should also be able to withstand damage from high velocity jets of water or oil used to wash the tanks.

NOTE 1 This protection may require mounting the ALGs in still-pipes.

NOTE 2 Alternately, this protection may require that the ALGs with a float or displacer-type level-sensing element be raised to a "store" position when it is not being used. Note that such ALGs cannot be used during tank washing.

4.2.4 Manual gauging

When an ALG is set or verified by manual gauging, the manual gauging should be performed to obtain the highest accuracy (see ISO 4512).

4.2.5 Minimum measurable level

The ALG should be able to measure levels as near to the bottom of the tank as possible. This may require provision of a sump in the tank bottom in vessels with double bottoms.

NOTE The minimum measurable level of certain types of ALGs may limit their ability to measure small volumes of ROB/OBQ.

4.2.6 Trim and list

For the best accuracy, the vessel should be on an even keel and upright. In situations where both trim and list exist, every effort should be made to eliminate at least one condition, preferably list.

Trim and list corrections are not required on vessel tanks of cuboid (i.e. rectangular prism) shape, provided that the ALG is located at the geometric centre of the deck area for the tank. Where the ALG is not so located, correction will be required. On vessel tanks that have curvature(s), such as the aft and forward wing tanks, trim and list corrections are recommended. Correction for trim, list and wedge is permissible by table or calculation, using the procedure described in ISO 8697.

4.2.7 Product temperatures

Product temperatures should be measured at the same time as the tank level is measured. The temperature should be representative of the tank contents and should be measured as described in ISO 4266-5.

4.2.8 Compatibility

All parts of the ALG in contact with the product should be compatible with the product, to avoid product contamination.