Manual of Petroleum Measurement Standards Chapter 17.10.1

Refrigerated Light Hydrocarbon Fluids—Measurement of Cargoes on Board Marine LNG Carriers

ANSI/API *MPMS* CHAPTER 17.10.1
SECOND EDITION, JUNE 2021

ISO 10976:2015 (Modified), Refrigerated light hydrocarbon fluids—Measurement of cargoes on board LNG carriers

Special Notes

API publications necessarily address problems of a general nature. With respect to particular circumstances, local, state, and federal laws and regulations should be reviewed. The use of API publications is voluntary. In some cases, third parties or authorities having jurisdiction may choose to incorporate API standards by reference and may mandate compliance.

Neither API nor any of API's employees, subcontractors, consultants, committees, or other assignees make any warranty or representation, either express or implied, with respect to the accuracy, completeness, or usefulness of the information contained herein, or assume any liability or responsibility for any use, or the results of such use, of any information or process disclosed in this publication. Neither API nor any of API's employees, subcontractors, consultants, or other assignees represent that use of this publication would not infringe upon privately owned rights.

API publications may be used by anyone desiring to do so. Every effort has been made by the Institute to ensure the accuracy and reliability of the data contained in them; however, the Institute makes no representation, warranty, or guarantee in connection with this publication and hereby expressly disclaims any liability or responsibility for loss or damage resulting from its use or for the violation of any authorities having jurisdiction with which this publication may conflict.

API publications are published to facilitate the broad availability of proven, sound engineering and operating practices. These publications are not intended to obviate the need for applying sound engineering judgment regarding when and where these publications should be utilized. The formulation and publication of API publications is not intended in any way to inhibit anyone from using any other practices.

Any manufacturer marking equipment or materials in conformance with the marking requirements of an API standard is solely responsible for complying with all the applicable requirements of that standard. API does not represent, warrant, or guarantee that such products do in fact conform to the applicable API standard.

Classified areas may vary depending on the location, conditions, equipment, and substances involved in any given situation. Users of this standard should consult with the appropriate authorities having jurisdiction.

Users of this standard should not rely exclusively on the information contained in this document. Sound business, scientific, engineering, and safety judgment should be used in employing the information contained herein.

The examples in this standard are merely examples for illustration purposes only. (Each company should develop its own approach.) They are not to be considered exclusive or exhaustive in nature. API makes no warranties, express or implied for reliance on or any omissions from the information contained in this document.

Where applicable, authorities having jurisdiction should be consulted.

API is not undertaking to meet the duties of employers, manufacturers, or suppliers to warn and properly train and equip their employees, and others exposed, concerning health and safety risks and precautions, nor undertaking their obligations to comply with authorities having jurisdiction.

Information concerning safety and health risks and proper precautions with respect to particular materials and conditions should be obtained from the employer, the manufacturer or supplier of that material, or the material safety data sheet.

API Foreword

Nothing contained in any API publication is to be construed as granting any right, by implication or otherwise, for the manufacture, sale, or use of any method, apparatus, or product covered by letters patent. Neither should anything contained in the publication be construed as insuring anyone against liability for infringement of letters patent.

The verbal forms used to express the provisions in this document are as follows.

Shall: As used in a standard, "shall" denotes a minimum requirement in order to conform to the standard.

Should: As used in a standard, "should" denotes a recommendation or that which is advised but not required in order to conform to the standard.

May: As used in a standard, "may" denotes a course of action permissible within the limits of a standard.

Can: As used in a standard, "can" denotes a statement of possibility or capability.

This document was produced under API standardization procedures that ensure appropriate notification and participation in the developmental process and is designated as an API standard. Questions concerning the interpretation of the content of this publication or comments and questions concerning the procedures under which this publication was developed should be directed in writing to the Director of Standards, American Petroleum Institute, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001. Requests for permission to reproduce or translate all or any part of the material published herein should also be addressed to the director.

The API Committee on Measurement Accountability voted to adopt a modified version of ISO 10976:2015 as the American National Standard ANSI/API *MPMS* Chapter 17.10.1. The modifications from the ISO standard have been incorporated directly into the text.

Generally, API standards are reviewed and revised, reaffirmed, or withdrawn at least every five years. A one-time extension of up to two years may be added to this review cycle. Status of the publication can be ascertained from the API Standards Department, telephone (202) 682-8000. A catalog of API publications and materials is published annually by API, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001.

Suggested revisions are invited and should be submitted to the Standards Department, API, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001, standards@api.org.

ISO 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 (see 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 (see 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: http://www.iso.org/iso/home/standards_development/resources-for-technical-work/foreword.htm.

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 10976:2012), of which it constitutes a minor revision.

Contents

Figures

Tables

Introduction

This International Standard provides accepted methods for measuring quantities on liquefied natural gas (LNG) carriers for those involved in the LNG trade on ships and onshore. It includes recommended methods for measuring, reporting, and documenting quantities on board these vessels.

This International Standard is intended to establish uniform practices for the measurement of the quantity of cargo on board LNG carriers from which the energy is computed. It details the commonly used current methods of cargo measurement, but is not intended to preclude the use or development of any other technologies or methods or the revision of the methods presented. It is intended that the reader review, in detail, the latest editions of the publications, standards, and documents referenced in this International Standard in order to gain a better understanding of the methods described.

This International Standard is not intended to supersede any safety or operating practices recommended by the organizations, such as the International Maritime Organization (IMO), the International Chamber of Shipping (ICS), the Oil Companies International Marine Forum (OCIMF), the International Group of Liquefied Natural Gas Importers (GIIGNL), and the Society of International Gas Tanker and Terminal Operators (SIGTTO), or individual operating companies. This International Standard is not intended to supersede any other safety or environmental considerations, local regulations, or the specific provisions of any contract.

The International System of Units (SI) is used throughout this International Standard as the primary units of measure because this system is commonly used in the industry for these types of cargoes. However, as some LNG carrier tanks are calibrated in the US customary units and some sales and purchase agreements are made in the US customary units, both SI and US customary equivalents are shown. Proper unit conversion is intended to be applied, documented, and agreed upon among all parties involved in the LNG custody transfer.

Refrigerated Light Hydrocarbon Fluids—Measurement of Cargoes on Board Marine LNG Carriers

1 Scope

This International Standard establishes all of the steps needed to properly measure and account for the quantities of cargoes on liquefied natural gas (LNG) carriers. This includes, but is not limited to, the measurement of liquid volume, vapor volume, temperature and pressure, and accounting for the total quantity of the cargo on board. This International Standard describes the use of common measurement systems used on board LNG carriers, the aim of which is to improve the general knowledge and processes in the measurement of LNG for all parties concerned. This International Standard provides general requirements for those involved in the LNG trade on ships and onshore.

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.

API *Manual of Petroleum Measurement Standards* (*MPMS*) Chapter 8.2, *Refrigerated Light Hydrocarbon Fluids—Sampling of Liquefied Natural Gas—Continuous and Intermittent Methods*

API *MPMS* Chapter 17.1, *Guidelines for Marine Inspection*

API *MPMS* Chapter 17.9, *Vessel Experience Factor (VEF)*

EN 1160 [1], *Installations and equipment for liquefied natural gas—General characteristics of liquefied natural gas*

GPA 2166 [2], *Obtaining Natural Gas Samples for Analysis by Gas Chromatography*

GPA 2261, *Analysis for Natural Gas and Similar Gaseous Mixtures by Gas Chromatography*

IACS Unified Requirements E10 [3], *Test Specification for Type Approval*

ICS [4], *Tanker Safety Guide (Liquefied Gas)*

IEC 60533 [5], *Electrical and electronic installations in ships—Electromagnetic compatibility (EMC)—Ships with a metallic hull*

ISO 6974 (all parts) [6], *Natural gas—Determination of composition and associated uncertainty by gas chromatography*

ISO 8310, *Refrigerated hydrocarbon and non-petroleum based liquefied gaseous fuels—General requirements for automatic tank thermometers on board marine carriers and floating storage*

---

1 European Committee for Standardization (CEN), Management Centre, Rue de la Science 23, B - 1040 Brussels, Belgium, https://www.cen.eu.

2 GPA Midstream Association, 6060 American Plaza, Suite 700, Tulsa, Oklahoma 74135, https://gpamidstream.org.

3 International Association of Classification Societies, 4 Matthew Parker St, Westminster, London SW1H 9NP, United Kingdom, https://www.iacs.org.uk.

4 International Chamber of Shipping, 38 St. Mary Axe, London EC3A 8BH, United Kingdom, https://www.ics-shipping.org.

5 International Electrotechnical Commission, 3 rue de Varembé, CH-1211 Geneva 20, Switzerland, www.iec.ch.

6 International Organization for Standardization, ISO Central Secretariat, Chemin de Blandonnet 8, CP 401 – 1214 Vernier, Geneva, Switzerland, www.iso.org.