Manual of Petroleum Measurement Standards Chapter 8.6

Refrigerated Light Hydrocarbon Fluids—Sampling of Liquified Natural Gas—Continuous and Intermittent Methods

ANSI/API *MPMS* CHAPTER 8.6
FIRST EDITION, MAY 2020

REAFFIRMED, JULY 2026

ISO 8943 (Modified), Refrigerated light hydrocarbon fluids – Sampling of liquified natural gas – Continuous and intermittent methods



American Petroleum Institute





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.

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 assure 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.

All rights reserved. No part of this work may be reproduced, translated, stored in a retrieval system, or transmitted by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission from the publisher. Contact the Publisher, API Publishing Services, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001.

Copyright © 2020 American Petroleum Institute

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, 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 Quality (COMQ) voted to adopt a modified version of ISO 8943-2007 as American National Standard ANSI/API MPMS Chapter 8.6. These modifications from the ISO standard have been incorporated directly into the text and are highlighted. See the highlighted text in the Introduction for an explanation of the modifications.

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, Suite 1100, Washington, DC 20001.

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

Contents

Page

1 Scope . . . 1
2 Normative References . . . 1
3 Terms and Definitions . . . 1
4 Outline of Sampling System . . . 3
4.1 General . . . 3
4.2 Continuous Sampling . . . 3
4.3 Intermittent Sampling . . . 6
5 Precautions . . . 7
5.1 Precautions to be Taken in Handling LNG . . . 7
5.2 Partial Evaporation of the LNG Sample . . . 7
5.3 Supervision During Sampling . . . 7
6 Apparatus . . . 7
6.1 Materials Used . . . 7
6.2 Sampling Extraction Point . . . 7
6.3 Sample Probe . . . 7
6.4 LNG Sample Vaporizer . . . 8
6.5 Compressor for Transferring Gasified LNG . . . 9
6.6 Pressure Regulator . . . 9
6.7 Gas Sample Holder (if required) . . . 9
6.8 Gas Sample Compressor . . . 9
6.9 Gas Sample Container or CP/FP Sample Container . . . 10
6.10 Piping Arrangement . . . 11
6.11 Sample Filter . . . 11
7 Sampling Procedure . . . 11
7.1 General . . . 11
7.2 Sampling Period . . . 11
7.3 Consecutiveness of Sampling . . . 11
7.4 Suspension of Sampling . . . 12
7.5 Continuous Sampling . . . 12
7.6 Intermittent Sampling . . . 13
8 Test Report . . . 13
Annex A (informative) Example of Calculation of Degree of Sub-cooling . . . 15
Annex B (informative) Constant Pressure (CP)/Floating Piston (FP) Sample Container with Technical Specifications . . . 18

Figures

1 Example of Continuous Sampling for a Water-seal-type Gas Sample Holder with a Compressor . . . 4
2 Example of Continuous Sampling for a Waterless-type Gas Sample Holder . . . 5
3 Example of Intermittent Sampling for CP/FP Sample Container . . . 6
4 Sampling Probe Inside the SIde of the Main LNG Header . . . 8
5 Sampling Probe Inside the Bottom of the Main LNG Header . . . 8
6 Gas Sample Container . . . 10
7 CP/FP Sample Container . . . 10
8 Sampling Period . . . 12

Contents

Page

A.1 Enthalpy of the Saturated Liquid 17
B.1 Configuration for Cleaning the CP/FP Sample Container 21

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.

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 8943 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 cancels and replaces the first edition (ISO 8943:1991), which has been technically revised.

Introduction

In the custody transfer of liquefied natural gas, hereinafter referred to as LNG, it is common practice to determine the quantity transferred on a calorific-content basis. The total calorific content of quantities of LNG quoted in the custody transfer is determined by the liquid volume, liquid density and gross calorific value of the LNG delivered.

At the time of publication, this standard discusses current technology proven to minimize sampling uncertainty, as indicated by the highlighted modifications. Future technology has to be performance-based and meet the requirement of providing an accurate sample of the LNG transfer. The LNG sampling devices have to ensure the total and continuous vaporization of a quantity of LNG. This quantity has to be sufficient for taking gaseous samples representative of the LNG being (un)loaded.

A knowledge of the composition of the LNG is required in order to calculate the density and the calorific content of quantities of LNG. Therefore, precise sampling is a prerequisite for precise analysis.

LNG is a complex mixture of low-molecular-weight hydrocarbons with nitrogen as a principal inert impurity. Typically, methane is the major component. Minor-component concentrations vary with the source of the raw gas, the liquefaction pre-treatment, the liquefaction process and the storage conditions.

Refrigerated Light Hydrocarbon Fluids — Sampling of Liquefied Natural Gas — Continuous and Intermittent Methods

1 Scope

This International Standard specifies methods for the continuous and the intermittent sampling of LNG while it is being transferred through an LNG transfer line.

2 Normative References

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

ISO 10715:1997, *Natural gas — Sampling guidelines*

API *MPMS* Chapter 14.1, *Collecting and Handling of Natural Gas Samples for Custody Transfer*

3 Terms and Definitions

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

3.1
accumulator
Storage vessel provided to absorb pressure pulsations of gasified LNG and to homogenize the same.

3.2
bubbling
Procedure, in the case of a water-seal-type gas sample holder, to saturate the seal water in a gas sample holder with gasified LNG in order to suppress the effect of the seal water on the gas sample.

3.3
compressor for transferring gasified LNG
Compressor used for boosting the pressure of gasified LNG when gasified LNG in the LNG sample vaporizer cannot be transferred to the gas sample holder by its inherent pressure.

3.4
constant pressure/floating piston sample container
CP/FP sample container
Sample container, abbreviated as CP/FP sample container and usually used for intermittent sampling, capable of maintaining constant pressure during the sampling of gas from the process line into the gas cylinder.

3.5
continuous sampling
Continuous collection of LNG from the main line during loading/unloading operations.

NOTE The fully vaporized LNG from the vaporizer is thereafter continuously fed into the gas sample holder. Gas sample containers are filled with the mixed gas from this gas holder after completion of the sampling process for offline analysis.

3.6
gas sample container
Sample container, usually used for continuous sampling, used for the retention of the gas sample and for its transfer to an analyzing instrument.

3.7
gas sample compressor
Compressor used for charging the gas sample collected in a gas sample holder into a gas sample container.