Plunger Lift Lubricators and Related Equipment

API SPECIFICATION 11PL
FIRST EDITION, JUNE 2019

API MONOGRAM PROGRAM EFFECTIVE DATE: JUNE 1, 2020

REAFFIRMED, MARCH 2025



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 © 2019 American Petroleum Institute

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.

For API Monogram Program licensees and APIQR Program registrants, this standard shall become effective on the program date printed on the cover but may be used voluntarily from the date of publication.

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, Definitions, Acronyms, and Abbreviations . . . 2
3.1 Terms and Definitions . . . 2
3.2 Acronyms and Abbreviations . . . 6

4 Functional Specification . . . 7
4.1 General . . . 7
4.2 Lubricator Type Selection . . . 7
4.3 Well Parameters . . . 10
4.4 Operational Parameters . . . 11
4.5 Environmental Compatibility . . . 11
4.6 Compatibility with Related Well Equipment . . . 11
4.7 Validation Grade Selection . . . 12
4.8 Quality Grade Selection . . . 12
4.9 Functional Testing . . . 12
4.10 Temperature Range Selection . . . 12

5 Technical Specification . . . 13
5.1 General . . . 13
5.2 Technical Characteristics . . . 13
5.3 Design Requirements . . . 13
5.4 Materials . . . 15
5.5 Welding and Brazing . . . 17
5.6 Coatings, Platings, Painting, and Overlays . . . 17
5.7 Surface Treatments . . . 17
5.8 Design Ratings . . . 18
5.9 Catcher Validation Testing . . . 19
5.10 Kinetic Energy (KE) . . . 19
5.11 Design Verifications . . . 20
5.12 Design Validation Requirements . . . 21
5.13 Design Changes . . . 22

6 Supplier/Manufacturer Requirements . . . 23
6.1 General . . . 23
6.2 Documentation . . . 23
6.3 Product Identification . . . 26
6.4 Quality Requirements . . . 27
6.5 Validation Levels . . . 29
6.6 Functional Testing Requirements . . . 29
6.7 Charpy Impact Technique . . . 29
6.8 Calibration Systems . . . 30
6.9 Heat Treatment . . . 30
6.10 Additional Processes . . . 31
6.11 Component Traceability . . . 31
6.12 NDE Inspections . . . 31

7 Repair/Redress Requirements . . . 38

8 Shipping, Handling, and Storage . . . 38

Contents

Page

Annex A (informative) API Monogram Program Use of the API Monogram by Licensees 39

Annex B (normative) Validation Testing Requirements 43

Annex C (normative) Functional Testing Requirements 51

Annex D (normative) Wellbore Access Connection 53

Annex E (informative) Guidelines for Operations of Plunger Lift Lubricators 55

Bibliography 62

FIgures

1 Example Quick-union-type Lubricator with Manual Catcher Illustration 7
2 Example Quick-union-type Lubricator with Auto Catcher Illustration 8
B.1 Catcher Test Plunger Upper End Design 47
D.1 Quick Union Connection Illustration 54
E.1 Tubing Head Adapter Example 57
E.2 Kinetic Energy Curves 58

Tables

1 Design Validation Grade Summary 12
2 Quality Grade Summary 12
3 Typical Temperature Ranges 12
4 API Specification 6A, 20th Edition (SI Units) Applicable Table 14
5 API Specification 6A, 20th Edition (USC Units), Applicable Table 15
6 Kinetic Energy Reference Table 21
7 Design Validation Grade Hierarchy 22
8 Marking Requirements 27
9 Summary of Quality Grade Requirements 28
10 Validation Grade Requirements Summary 29
11 Adjustment Factors for Sub-size Impact Specimens 30
12 Type 1 Component NDE Requirements Summary 32
13 Type 2 Component NDE Requirements Summary 33
14 Sampling Plan Unit Count Requirements 34
B.1 Test Plunger Dimensions and Weights 47
D.1 Quick Union Identification and Characteristics 54
E.1 Example General Lubricator Ordering Form 55
E.2 Summary of Periodic Maintenance Intervals 60

Introduction

This specification has been developed by users/purchasers and suppliers/manufacturers of plunger lift lubricators intended for use in the petroleum and natural gas industry worldwide. This specification is intended to give requirements and information to both parties in the selection, manufacture, testing and use of plunger lift lubricators. Further, this specification addresses supplier/manufacturer requirements which set the minimum requirements with which suppliers/manufacturers shall conform.

This specification has been structured to allow for grades of increased requirements both in quality control and design validation. These variations allow the user/purchaser to select the grade required for a specific application for a chosen tool.

The quality grades and design validation grades provide the user/purchaser the choice of requirements to meet a specific preference or application. Additional quality and design validation requirements may be specified by the user/purchaser as supplemental requirements.

Plunger Lift Lubricators and Related Equipment

1 Scope

This specification provides requirements and guidelines for plunger lift lubricators, which includes plunger catchers as defined herein for use in the petroleum and natural gas industry. Threaded and flanged external connections are covered by the applicable API or proprietary connection design requirements. This specification provides requirements for the functional specification and technical specification, including design requirements (outlet locations, specified and optional), design extensions, design verification and validation, welding, materials, quality controls (QCs), marking, documentation and data control, shipment, and storage.

This specification does not include control system components, including electrical and electronic devices, installation requirements, field modifications of lubricators, and plunger lift downhole equipment. Additionally, the requirements for the inlet and outlet flange bolting and gaskets are not addressed herein. Equipment and technology that are covered by other API specifications and standards are exempted from this specification.

This specification includes five annexes: Annex A (informative), Annexes B through D (normative), and Annex E, which is informative and includes guidelines for plunger lift lubricator use and maintenance.

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.

API Specification 5B, *Specification for Threading, Gauging, and Thread Inspection of Casing, Tubing, and Line Pipe Threads*, 15th Edition

API Recommended Practice 5B1, *Gauging and Inspection of Casing, Tubing, and Line Pipe Threads*

API Specification 5CRA, *Specification for Corrosion-resistant Alloy Seamless Tubes for Use as Casing, Tubing and Coupling Stock*

API Specification 5CT, *Specification for Casing and Tubing*, Ninth Edition

API Specification 6A, *Specification for Wellhead and Christmas Tree Equipment*, 20th Edition

API Specification 20A, *Carbon Steel, Alloy Steel, Stainless Steel, and Nickel Base Alloy Castings for Use in the Petroleum and Natural Gas Industry*

API Specification Q1, *Specification for Quality Management System Requirements for Manufacturing Organizations for the Petroleum and Natural Gas Industry*

ANSI [1]/NACE [2] MR0175/ISO [3] 15156 (all parts), *Petroleum and natural gas industries—Materials for use in H_2S-containing environments in oil and gas production*

ASME *Boiler Pressure and Vessel Code* (*BPVC*) [4], *Section IX: Welding, Brazing, and Fusing Qualifications*

---

1 American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, New York 10036, www.ansi.org.

2 NACE International, 15835 Park Ten Place, Houston, Texas 77084, www.nace.org.

3 International Organization for Standardization, 1, ch. de la Voie-Creuse, Case postale 56, CH-1211 Geneva 20, Switzerland, www.iso.org.

4 ASME International, 2 Park Avenue, New York, New York 10016-5990, www.asme.org.