Specification for Downhole Well Test Tools and Related Equipment

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Foreword

This specification has been developed by users/purchasers and suppliers/manufacturers of downhole well test tools 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 the tools named within the scope. Furthermore, this specification addresses the minimum requirements with which the supplier/manufacturer is to comply so as to claim conformity with this specification.

Users of this specification should be aware that requirements above those outlined in this specification may be needed for individual applications. This specification is not intended to inhibit a supplier/manufacturer from offering, or the user/purchaser from accepting, alternative equipment or engineering solutions. This may be particularly applicable where there is innovative or developing technology. Where an alternative is offered, the supplier/manufacturer should identify any variations from this specification and provide details.

This first edition of the specification has been authored in an effort to cover the prominent range of well test tools. Additionally included are requirements for service centers to ensure these products perform as designed when maintained as defined therein. It is recognized that these requirements may merit some refinement following their utilization.

Included in this specification are nine annexes (Annexes A through I), all of which are normative except Annexes H and I. Where referenced, these annexes provide mandatory requirements for conformance to this specification.

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Suggested revisions are invited and should be submitted to the Standards Department, API, 1220 L Street, NW, Washington, DC 20005, standards@api.org.

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Introduction

This specification applies to downhole well test tools that prior to this publication were not addressed by standards or specifications. Additionally, this specification defines requirements for service centers from which these tools are typically provided and maintained.

This specification has been developed by users/purchasers and suppliers/manufacturers of downhole well test tools and related equipment as defined herein and intended for use in the petroleum and natural gas industry worldwide to give requirements and information to both parties in the selection, manufacture, testing, and use of these tools. Furthermore, this specification addresses the minimum requirements with which the supplier/manufacturer is to comply so as to claim conformity with this specification.

This specification has been structured with a single grade of quality control requirements and three grades of design validation. These validation grades provide the user/purchaser the choice of requirements to meet their preference or application. Design validation grades V3 (well test tools) and V3-TP (well test packers) are the minimum grades, and V1 (well test tools) and V1-TP (well test packers) are the most stringent grades.

Annexes A, B, C, D, E, F, and G are normative requirements, whereas Annexes H and I are informative.

Annexes are as follows:

— Annex A—Validation Requirements for Downhole Well Test Tools and Related Equipment;

— Annex B—Factory Acceptance Testing;

— Annex C—Service Center Requirements;

— Annex D—Performance Rating Envelopes;

— Annex E—Well Testing Packer Requirements;

— Annex F—Electronic and Electrical Components, Subcomponents, and Systems Requirements;

— Annex G—Testing Surface Safety Valve Requirements;

— Annex H—Applications Overview;

— Annex I—Operational Recommendations.

The international system of units (SI) is used in this specification; however, U.S. customary units are also shown for reference.

Users of this specification should be aware that requirements above those outlined in this specification may be needed for individual applications. This specification is not intended to inhibit a supplier/manufacturer from offering, or the user/purchaser from accepting, alternative equipment or engineering solutions. This may be particularly applicable where there is innovative or developing technology. Where an alternative is offered, the supplier/manufacturer should identify any variations from this specification and provide details.

Specification for Downhole Well Test Tools and Related Equipment

1 Scope

This specification provides the requirements for downhole well test tools and related equipment as they are defined herein for use in the petroleum and natural gas industries. Included are the requirements for design, design validation, manufacturing, functional evaluation, quality, handling, storage, and service centers. Tools utilized in downhole well test operations include tester valves, circulating valves, well testing packers, safety joints, well testing safety valves, testing surface safety valves (TSSVs), slip joints, jars, work string tester valves, sampler carriers, gauge carriers, drain valves, related equipment, and tool end connections.

This specification does not cover open hole well test tools, downhole gauges, samplers, surface equipment, subsea safety equipment, perforating equipment and accessories, pup joints external to well test tool assemblies, work string and its connections, conveyance or intervention systems, installation, control and monitoring conduits, and surface control systems.

A downhole well test is an operation deploying a temporary completion in a well to safely acquire dynamic rates, formation pressure/temperature, and formation fluid data. Downhole well test tools are also used in operations of well perforating, well shut-ins, circulation control of fluids, and stimulation activities. This document covers the downhole tools used to perform these operations; however, the operational requirements of performing these operations are not included.

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 5CT, *Specification for Casing and Tubing*

ASME *Boiler and Pressure Vessel Code* (*BPVC*) [1], *Section IX: Welding and Brazing Qualifications*

ASNT SNT-TC-1A [2], *Recommended Practice for Personnel Qualification and Certification in Non-destructive Testing*

ASTM E10 [3], *Standard Test Methods for Brinell Hardness Testing of Metallic Materials*

ASTM E18, *Standard Test Methods for Rockwell Hardness of Metallic Materials*

ASTM E165/E165M, *Standard Practice for Liquid Penetrant Examination for General Industry*

ASTM E384, *Standard Test Method for Microindentation Hardness of Materials*

ISO 3601-1 [4], *Fluid power systems—O-rings—Part 1: Inside diameters, cross-sections, tolerances and designation codes*

ISO 3601-3, *Fluid power systems—O-rings—Part 3: Quality acceptance criteria*

ISO 6506 (all parts), *Metallic materials—Hardness test—Brinell test*

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1 ASME International, 2 Park Avenue, New York, New York 10016-5990, www.asme.org.
2 American Society for Nondestructive Testing, 1711 Arlingate Lane, P.O. Box 28518, Columbus, Ohio 43228, www.asnt.org.
3 ASTM International, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428, www.astm.org.
4 International Organization for Standardization, 1, ch. de la Voie-Creuse, Case postale 56, CH-1211 Geneva 20, Switzerland, www.iso.org.