Interval Control Valves (ICV)

API SPECIFICATION 19ICV
FIRST EDITION, JUNE 2023

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Introduction

This specification has been developed by users/purchasers and suppliers/manufacturers of interval control valves (ICV) and related equipment as defined herein and is 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. Further, this specification addresses the minimum requirements with which the supplier/manufacturer is to conform so as to claim conformity with this specification.

This specification covers the best practices and establishes a clear framework to define performance characteristics and validation methods. For the purposes of this document an ICV is a component of an advanced well completion that is remotely actuated multiple times to control fluid flow through the ICV in both production and injection directions. The ICV uses actuation means such as hydraulic, electric, wireless technologies or combinations thereof without use of mechanical intervention.

This specification has been structured with grades of increased requirements in quality control and design validation. These grades allow the user/purchaser to select the level of requirements that are required for a specific application.

There are three quality levels: 1) quality level QL3 is the minimum level of quality offered by this product specification; 2) quality level QL2 provides additional inspection and verification steps; and 3) quality level QL1 is the highest level provided. Additional quality requirements can be specified by the user/purchaser as supplemental requirements.

There are three design validation grades, which provide the user/purchaser with a choice of requirements to meet their preference or application. Design validation grade V3 is the minimum grade and V1 is the most stringent grade provided.

The International System of Units (SI) is used in this International Standard, however U.S. Customary (USC) or other units are also shown for reference.

Users of this specification should be aware that requirements beyond those outlined in this specification may be necessary 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 can be particularly applicable where there is innovative or developing technology. Where an alternative is offered, it is the responsibility of the supplier/manufacturer to identify any variations from this specification and provide details.

This specification was initiated using *Recommended Practice for Interval Control Valves 3362* provided by the Advanced Well Equipment Standards group.

Interval Control Valves (ICV)

1 Scope

This specification provides the requirements for downhole interval control valves (ICV) as they are defined herein for use in the petroleum and natural gas industries. Included are the minimum requirements for a functional specification, design verification, design validation of performance ratings, manufacturing, functional evaluations, shipping, handling, and storage. Also included are requirements for downhole control modules which are necessary for the defined operations of the ICV.

ICVs conforming to this specification are not designated as well safety devices.

This specification does not include any additional requirements for high-pressure high-temperature (HPHT) environments with a pressure rating greater than 103.4 MPa (15,000 psi) or with a temperature rating greater than 177 °C (350 °F).

This specification does not cover validation testing with gas medium.

This specification does not cover applications, installation, operation, and maintenance. Control systems components for the ICV which are designated for positions above the tubing hanger are not included.

Also not included are products covered under other API specifications and the following products: remotely operated gas lift valves, inflow control devices (ICD) and autonomous ICDs, through tubing mechanically operated sliding sleeves, valves designed to function a single time, well-condition-activated valves or well test tools. Also not included are secondary tools, control conduits including the connections, and reservoir monitoring devices not critical to the operation of the ICV. End connections of the ICV to the well conduit 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 Manual of Petroleum Measurement Standards, Chapter 10.4*: Determination of Sediment and Water in Crude Oil by the Centrifuge Method (Field Procedure)*

API Specification 14L, *Lock Mandrels and Landing Nipples*

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*

ASME, Boiler and Pressure Vessel Code (BPVC), Section VIII*: Rules for Construction of Pressure Vessels*

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

ASNT SNT-TC-1A, *Recommended practice for personnel qualification and certification in nondestructive testing*

ASTM A370, *Standard Test Methods and Definitions for Mechanical Testing of Steel Products*

ASTM D395, *Standard Test Methods for Rubber Property—Compression Set*

ASTM D412, *Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension*