

# Standard for Actuators and Mounting Kits for Valves

API STANDARD 6DX  
SECOND EDITION, FEBRUARY 2020

ADDENDUM 1, MARCH 2023  
ERRATA 1, APRIL 2023



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 20001-5571.

## 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.

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](mailto:standards@api.org).



# Contents

	Page
<b>1</b>	Scope..... 1
<b>2</b>	Normative References ..... 1
<b>3</b>	Terms, Definitions, Abbreviations, and Symbols ..... 2
<b>3.1</b>	Terms and Definitions ..... 2
<b>3.2</b>	Symbols and Abbreviated Terms ..... 5
<b>4</b>	Actuator Types and Configurations and Performance ..... 6
<b>4.1</b>	General ..... 6
<b>4.2</b>	Actuator Types ..... 6
<b>4.3</b>	Action on Loss of Input Supply ..... 7
<b>4.4</b>	Quality Management System..... 7
<b>5</b>	Design..... 7
<b>5.1</b>	Design Input..... 7
<b>5.2</b>	Interface with Valve..... 9
<b>5.3</b>	Hydraulic Fluid Requirements..... 10
<b>5.4</b>	Design Basis ..... 10
<b>5.5</b>	Pressure-containing Parts ..... 11
<b>5.6</b>	Mechanically Loaded Parts..... 11
<b>5.7</b>	Mounting Kit..... 13
<b>5.8</b>	Lifting ..... 14
<b>5.9</b>	Manual Override ..... 14
<b>5.10</b>	Locking Devices..... 14
<b>5.11</b>	Local Position Indicators ..... 14
<b>5.12</b>	Travel Stops ..... 14
<b>5.13</b>	Orientation ..... 14
<b>5.14</b>	Seals Preventing Water or Environmental Ingress ..... 15
<b>5.15</b>	Cleanliness During Assembly of Hydraulic Actuators ..... 15
<b>5.16</b>	Pressure Protection ..... 15
<b>5.17</b>	Design Documents ..... 15
<b>6</b>	Sizing of Actuators ..... 15
<b>7</b>	Instrumentation/Regulation ..... 15
<b>7.1</b>	Torque Limiting Settings—Electric Actuators ..... 15
<b>7.2</b>	Torque/Thrust Limiting Controls—Pneumatic/Hydraulic Actuators ..... 15
<b>7.3</b>	Position and Load Stops ..... 16
<b>8</b>	Materials ..... 18
<b>8.1</b>	Material Specification..... 18
<b>8.2</b>	Service Compatibility ..... 18
<b>8.3</b>	Environmental Conditions..... 18
<b>8.4</b>	Composition Limits ..... 18
<b>8.5</b>	Bolting..... 19
<b>8.5.2</b>	Bolting for Mechanically Loaded Parts ..... 19
<b>8.6</b>	Plating..... 19
<b>9</b>	Welding ..... 19
<b>9.1</b>	Welding of Pressure-containing Parts..... 19

## Contents

	Page
9.2	Structural Welding..... 20
9.3	Impact Testing..... 20
9.4	Hardness Testing..... 21
9.5	Repair..... 21
10	Quality Control..... 22
10.1	NDE and Inspection Requirements..... 22
10.2	Measuring and Test Equipment..... 22
10.3	Qualification of Inspection and Test Personnel..... 23
10.4	NDE of Repairs..... 24
11	Final Acceptance Testing..... 24
11.1	Pneumatic and Hydraulic Actuators..... 24
11.2	Electric Actuators..... 26
11.3	Actuator Functional Test..... 27
12	Surface Protection..... 27
13	Marking..... 28
14	Preparation for Shipment..... 28
15	Documentation..... 28
	Annex A (informative) Sizing of Actuators..... 31
	Bibliography..... 33

## Figures

1	Relationship Between Pressure..... 11
2	Charpy V-notch Weld Metal (WM) Specimen Location..... 20
3	Charpy V-notch Heat-affected Zone (HAZ) Specimen Location..... 21

## Tables

1	Position and Load Stops—Axial Flow Valves..... 16
2	Position and Load Stops—Ball Valves..... 16
3	Position and Load Stops—Check Valves..... 16
4	Position and Load Stops—Gate Valves (Expanding)..... 17
5	Position and Load Stops—Gate Valves (Slab)..... 17
6	Position and Load Stops—Plug Valves..... 17
7	Duration of Shell Tests..... 25
8	Duration of Piston and Vane Seal Tests..... 25
9	Marking of Pneumatic/hydraulic Actuators..... 28
10	Marking of Electric Actuators..... 28

**Contents**

	Page
<b>11</b> Required Documentation .....	29
<b>12</b> Record Retention .....	30



## **Introduction**

It is necessary that users of this document be aware that further or differing requirements can be needed for individual applications. This document is not intended to inhibit a vendor from offering, or the purchaser from accepting, alternative equipment or engineering solutions for the individual application. This can be particularly applicable where there is innovative or developing technology. Where an alternative is offered, it is the responsibility of the vendor to identify any variations from this document and provide details.

## **Units of measurement**

In this specification, data are expressed in both U.S. customary (USC) and metric (SI) units. For a specific order item, unless otherwise stated, only one system of units shall be used, without

## **Rounding**

Except as otherwise required by this specification, to determine conformance with the specified requirements, observed or calculated values are rounded to the nearest unit in the last right-hand place of figures used in expressing the limiting value, in accordance with the rounding method of ASTM E29 or ISO 80000-1, [Annex B](#), Rule A.

## **Conformance with this International Standard**

A quality system applied to assist compliance with the requirements of this International Standard is typically implemented by the manufacturer. The manufacturer is responsible for conforming with all the applicable requirements of this standard. It is permissible for the purchaser to make any investigation necessary to be assured of conformance



# Standard for Actuators and Mounting Kits for Valves

## 1 Scope

This standard defines the requirements for design, mechanical integrity, and sizing of actuators and related components, and is applicable to all types of electric, pneumatic, and hydraulic actuators, inclusive of mounting kit, installed on valves that conform to API Specification 6D.

This standard is not applicable to actuators installed on control valves, valves being used for regulation, valves in subsea service, handheld powered devices, manually operated gearboxes, instrument tubing and associated fittings, and actuator control equipment.

## 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 6D,<sup>1</sup> *Specification for Valves*

ASME Boiler and Pressure Vessel Code,<sup>2</sup> Section VIII, Division 1, *Rules for Construction of Pressure Vessels*

ASME Boiler and Pressure Vessel Code, Section VIII, Division 2, Alternative Rules, *Rules for Construction of Pressure Vessels*

ASME Boiler and Pressure Vessel Code, Section IX, *Welding and Brazing Qualifications*

ASNT SNT-TC-1A, *Non-Destructive Testing*

ASTM A370,<sup>3</sup> *Standard Test Methods and Definitions for Mechanical Testing of Steel Products*

ASTM B733, *Standard Specification for Autocatalytic (Electroless) Nickel-Phosphorus Coatings on Metal*

ASTM E29, *Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications*

AWS D1.1/D1.1M,<sup>4</sup> *Structural Welding Code — Steel*

AWS QC1, *Standard for AWS Certification of Welding Inspectors*

EN 10204,<sup>5</sup> *Metallic products — Types of inspection documents*

ISO 148-1,<sup>6</sup> *Metallic materials — Charpy pendulum impact test — Part 1: Test method*

ISO 4406:1999, *Hydraulic fluid power — Method for coding the level of contamination by solid particles*

ISO 5210, *Industrial valves — Multi-turn valve actuator attachments*

---

<sup>1</sup> American Petroleum Institute, 200 Massachusetts Ave, NW, Washington, DC 20001, USA.

<sup>2</sup> American Society of Mechanical Engineers International, 345 East 47th Street, New York, NY 10017-2392, USA.

<sup>3</sup> American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, USA.

<sup>4</sup> American Welding Society, 8669 NW 36 Street, #130, Miami, Florida 33166-6672, [www.aws.org](http://www.aws.org).

<sup>5</sup> CEN, European Committee for Standardization, Central Secretariat, Rue de Stassart 36, B-1050 Brussels, Belgium.

<sup>6</sup> International Organization for Standardization, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, [www.iso.org](http://www.iso.org).