International Association of Oil & Gas Producers

SPECIFICATION

IOGP S-611J

May 2025

Version 2.0

Supplementary Specification to API Standard 600 for Steel Gate Valves

NOTE This version (S-611J) of the specification document provides the justification statements for each technical requirement, but is otherwise identical in content to S-611.

JIP33 JOINT INDUSTRY PROGRAMME

Revision history

VERSION	DATE	PURPOSE
2.0	May 2025	Second Edition
1.0	May 2019	First Edition

Acknowledgements

This IOGP Specification was prepared by a Joint Industry Programme 33 Standardization of Equipment Specifications for Procurement organized by IOGP with support by the World Economic Forum (WEF).

Foreword

This specification was prepared under Joint Industry Programme 33 (JIP33) "Standardization of Equipment Specifications for Procurement" organized by the International Oil & Gas Producers Association (IOGP) with the support from the World Economic Forum (WEF). Companies from the IOGP membership participated in developing this specification to leverage and improve industry level standardization globally in the oil and gas sector. The work has developed a minimized set of supplementary requirements for procurement, with life cycle cost in mind, resulting in a common and jointly agreed specification, building on recognized industry and international standards.

Recent trends in oil and gas projects have demonstrated substantial budget and schedule overruns. The Oil and Gas Community within the World Economic Forum (WEF) has implemented a Capital Project Complexity (CPC) initiative which seeks to drive a structural reduction in upstream project costs with a focus on industry-wide, non-competitive collaboration and standardization. The CPC vision is to standardize specifications for global procurement for equipment and packages. JIP33 provides the oil and gas sector with the opportunity to move from internally to externally focused standardization initiatives and provide step change benefits in the sector's capital projects performance.

This specification has been developed in consultation with a broad user and supplier base to realize benefits from standardization and achieve significant project and schedule cost reductions.

The JIP33 work groups performed their activities in accordance with IOGP's Competition Law Guidelines (November 2020).

This second edition cancels and replaces the first edition published in May 2019. Due to technical writing requirements leading to extensive changes, this second edition should be treated as a new document.

Table of Contents

List of Tables

List of Figures

Introduction

The purpose of the IOGP S-611 specification documents is to define a minimum common set of requirements for the procurement of steel gate valves in accordance with API Standard 600, 14th edition, May 2021, Steel Gate Valves—Flanged and Butt-welding Ends, Bolted Bonnets, for application in the petroleum and natural gas industries.

The IOGP S-611 specification documents follow a common structure (as shown below) comprising a specification, also known as a technical requirements specification (TRS), a procurement data sheet (PDS), an information requirements specification (IRS) and a quality requirements specification (QRS). These four specification documents, together with the purchase order, define the overall technical specification for procurement.

JIP33 Specification for Procurement Documents
Supplementary Technical Requirements Specification (TRS)

This specification is to be applied in conjunction with the supporting PDS, IRS and QRS as follows.

IOGP S-611: Supplementary Specification to API Standard 600 for Steel Gate Valves

This specification defines technical requirements for the supply of the equipment and is written as an overlay to API 600, following the API 600 clause structure. Clauses from API 600 not amended by this specification apply as written. Modifications to API 600 defined in this specification are introduced by a description that includes the type of modification (i.e. *Add*, *Replace* or *Delete*) and the position of the modification within the clause.

NOTE Lists, notes, tables, figures, equations, examples and warnings are not counted as paragraphs.

IOGP S-611D: Procurement Data Sheet for Steel Gate Valves (API)

The PDS defines application-specific requirements. The PDS is applied during the procurement cycle only and does not replace the equipment data sheet. The PDS may also include fields for supplier-provided information required as part of the purchaser's technical evaluation. Additional purchaser-supplied documents may also be incorporated or referenced in the PDS to define scope and technical requirements for enquiry and purchase of the equipment.

IOGP S-611L: Information Requirements for Steel Gate Valves (API)

The IRS defines information requirements for the scope of supply. The IRS includes information content, format, timing and purpose to be provided by the supplier, and may also define specific conditions that invoke the information requirements.

IOGP S-611Q: Quality Requirements for Steel Gate Valves (API)

The QRS defines quality management system requirements and the proposed extent of purchaser conformity assessment activities for the scope of supply. Purchaser conformity assessment activities are defined through the selection of one of four generic conformity assessment system (CAS) levels on the basis of evaluation of the associated service and supply chain risks. The applicable CAS level is specified by the purchaser in the PDS or in the purchase order.

The specification documents follow the editorial format of API 600 and, where appropriate, the drafting principles and rules of ISO/IEC Directives Part 2.

The PDS and IRS are published as editable documents for the purchaser to specify application-specific requirements. The TRS and QRS are fixed documents.

The order of precedence of documents applicable to the supply of the equipment, with the highest authority listed first, shall be as follows:

a) regulatory requirements;

b) contract documentation (e.g. purchase order);

c) purchaser-defined requirements (e.g. PDS, IRS and QRS);

d) this specification;

e) API 600.

1 Scope

Add after third paragraph

For sizes larger than DN 1050 (NPS 42), the requirements of Annex H apply.

Justification

This requirement allows for the option to purchase wedge-type gate valves beyond the current size scope of API 600.

Add to section

Additional requirements or amendments (not included in this specification) may be needed to purchase valves of the following designs/applications:

— two-piece split wedge design;

— parallel seat double-disc gate design;

— pressure seal bonnet design;

— short pattern valves;

— cryogenic service valves with a design temperature below -46 °C (-50 °F);

— high-temperature valves with a design temperature above 455 °C (850 °F);

— buried valves with stem extensions;

— body cavity relief by external piping and valves;

— soft sealing parts (i.e., thermoplastics and elastomers).

Justification

This paragraph clarifies the scope by listing the items that are not excluded but may require some additional requirements for their purchase.

2 Normative References

Add to first paragraph

The following documents are referred to in this specification, the PDS (IOGP S-611D) or the IRS (IOGP S-611L) in such a way that some or all of their content constitutes requirements of these specification documents.

Add to section

ANSI/NACE MR0175/ISO 15156 (all parts), *Petroleum and natural gas industries — Materials for use in H2S-containing environments in oil and gas production*

ANSI/NACE MR0103/ISO 17945, *Petroleum, petrochemical and natural gas industries — Metallic materials resistant to sulfide stress cracking in corrosive petroleum refining environments*

API Recommended Practice 591:2019, *Process Valve Qualification Procedure*

API Specification 5L, *Line Pipe*

API Specification 6A, *Specification for Wellhead and Tree Equipment*

API Specification 6D:2021, *Specification for Valves*

API Specification 6FA, *Standard for Fire Test of Valves*

API Specification 17D:2021, *Specification for Subsea Wellhead and Tree Equipment*

API Standard 598:2023, *Valve Inspection and Testing*

API Standard 6ACRA, *Age-hardened Nickel-based Alloys for Oil and Gas Drilling and Production Equipment*

API Standard 602, *Globe, and Check Valves for Sizes DN 100 (NPS 4) and Smaller for the Petroleum and Natural Gas Industries*

ASME B16.34:2020, *Valves — Flanged, Threaded, and Welding End*

ASME B31.3:2022, *Process Piping*

ASME Boiler and Pressure Vessel Code (BPVC), *Section V:2023, Nondestructive Examination*

ASME Boiler and Pressure Vessel Code (BPVC), *Section VIII, Division 1:2023, Rules for Construction of Pressure Vessels*

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

ASME PCC-1, *Guidelines for Pressure Boundary Bolted Flange Joint Assembly*

ASNT ACCP-CP-1, *ASNT Central Certification Program*

ASNT SNT-TC-1A, *Personnel Qualification and Certification in Nondestructive Testing*

ASTM A262:2021, *Standard Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels*

ASTM A578/A578M, *Standard Specification for Straight-Beam Ultrasonic Examination of Rolled Steel Plates for Special Applications*

ASTM A609/A609M:2012, *Standard Practice for Castings, Carbon, Low-Alloy, and Martensitic Stainless Steel, Ultrasonic Examination Thereof*

ASTM A703/A703M, *Standard Specification for Steel Castings, General Requirements, for Pressure-Containing Parts*

ASTM A961/A961M, *Standard Specification for Common Requirements for Steel Flanges, Forged Fittings, Valves, and Parts for Piping Applications*

ASTM D4894, *Standard Specification for Polytetrafluoroethylene (PTFE) Granular Molding and Ram Extrusion Materials*

ASTM D4895, *Standard Specification for Polytetrafluoroethylene (PTFE) Resin Produced From Dispersion*

ASTM F2168, *Standard Specification for Packing Material, Graphitic, Corrugated Ribbon or Textured Tape, and Die-Formed Ring*

ASTM F2191/F2191M, *Standard Specification for Packing Material, Graphitic or Carbon Braided Yarn*

AWS A4.2M, *Standard Procedures for Calibrating Magnetic Instruments to Measure the Delta Ferrite Content of Austenitic and Duplex Austenitic-Ferritic Stainless Steel Weld Metal*

EN 1179, *Zinc and zinc alloys - Primary zinc*

EN 1591 (all parts), *Flanges and their joints - Design rules for gasketed circular flange connections*

EN 14772:2021, *Flanges and their joints - Quality assurance inspection and testing of gaskets in accordance with the series of standards EN 1514 and EN 12560*

FSA-G-604-07, *Oxidation Test Standard for Flexible Graphite Gasket Materials*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IOGP S-563:2021, *Material Data Sheets for Piping and Valve Components*

ISO 8249, *Welding — Determination of Ferrite Number (FN) in austenitic and duplex ferritic-austenitic Cr-Ni stainless steel weld metals*

ISO 9712, *Non-destructive testing — Qualification and certification of NDT personnel*

ISO 10497, *Testing of valves — Fire type-testing requirements*

ISO 13628-4:2010, *Petroleum and natural gas industries — Design and operation of subsea production systems — Part 4: Subsea wellhead and tree equipment*

ISO 15607, *Specification and qualification of welding procedures for metallic materials — General rules*

ISO 15609 (all parts), *Specification and qualification of welding procedures for metallic materials — Welding procedure specification*

ISO 15614-1, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys*

ISO 15848-1:2015/Amd.1:2017, *Industrial valves — Measurement, test and qualification procedures for fugitive emissions — Part 1: Classification system and qualification procedures for type testing of valves*

ISO 15848-2:2015, *Industrial valves — Measurement, test and qualification procedures for fugitive emissions — Part 2: Production acceptance test of valves*

ISO 17781:2017, *Petroleum, petrochemical and natural gas industries — Test methods for quality control of microstructure of ferritic/austenitic (duplex) stainless steels*

PED 2014/68/EU, *Pressure Equipment Directive*

Replace Section 3 title with

3 Terms, Definitions, and Acronyms

Add new section 3.0 to start of section

3.0 Acronyms

CRA corrosion-resistant alloy

DN diamètre nominal (French for nominal diameter)

EDS element data sheet

EP extreme pressure

HBW Brinell hardness with tungsten ball

HSE health, safety and environment

IP ingress protection (rating code)

MDS material data sheet

MPD maximum pressure differential

MT magnetic particle testing

NDE nondestructive examination

NPS nominal pipe size

OD outer/outside diameter

ppm parts per million

PT liquid penetrant testing

PTFE polytetrafluoroethylene

QSL quality specification level

RT radiographic testing

SWL safe working load

UT ultrasonic testing

VPCI vapor phase corrosion inhibitor

VT visual testing

Add new term 3.5

3.5
batch
component batch
Components of the same design, material, size, rating and heat number that are from a single purchase order and that are manufactured in the same location.

Add new term 3.6

3.6
corrosion allowance
The thickness that is added to the minimum required thickness given by the selected standard to account for loss of material due to corrosion.

Add new term 3.7

3.7
lagging
Material that is used for insulation.

Add new term 3.8

3.8
maximum pressure differential
MPD
The maximum difference, between the upstream and downstream pressure across the gate, at which the gate may be operated.

Add new term 3.9

3.9
position indicator
A device that shows the position of the valve gate.

Add new term 3.10

3.10
pressure-containing part
A part whose failure to function as intended results in a release of contained fluid into the environment and that includes, as a minimum, the body, bonnet, stem, gland flange and pressure boundary bolting.

Add new term 3.11

3.11
pressure-controlling part
A part that is intended to prevent or permit the flow of fluids and that includes, as a minimum, the gate and the seats.

Add new term 3.12

3.12
tack weld
A temporary weld that is used to fix the workpieces or assemblies to be joined in proper position for welding.

Add new term 3.13

3.13
drive train
A part of the valve drive that is located between the operator and the gate and includes, as a minimum, the stem, gate, yoke, stem nut, bonnet and bolting, but excludes the operator.

Add new term 3.14

3.14
operator actuator
A mechanical device (or assembly) for opening or closing a valve.

Note 1 to entry: The operator actuator can be a handwheel with or without a gearbox.

Note 2 to entry: The operator actuator can be an electric, hydraulic or gas device bolted or otherwise attached to the valve.

Add new term 3.15

3.15
major weld repair
Weld repair where either the depth exceeds the lesser of 0.2 of the wall thickness and 25 mm (1 in.), or the repair surface area exceeds 65 cm^2 (10 in^2).

4 Pressure/Temperature Ratings

Add new section

4.5 Cavity Relief

4.5.1

When body cavity relief is specified, a hole with a diameter greater than or equal to 3 mm (0.12 in.) shall be drilled in the closure member outside the seat facing area.

Justification

Where there is a possibility that design configuration and service conditions can lead to trapped process fluid in the center cavity of the valve, it is essential to provide cavity relief. If this is not addressed, the integrity of the valve can be compromised.

4.5.2

The pressure-relief hole shall connect the valve body cavity with the high-pressure side of the valve when in the closed position.

Justification

This requirement ensures that the valve does not leak through the gate.

5 Design

Add new section 5.0 before section 5.1

5.0 Design Codes

Valves shall be in accordance with ASME B16.34 standard class gate valves.

Justification

This requirement ensures standardization of the specification used for general valve design requirements and also reference to ASME B16.34 specification in general rather than multiple references to selected sections.

5.3 Body Dimensions

5.3.1 Flanged Ends

5.3.1.1

Add to section

The minimum Brinell hardness of grooves of ring type joint flanges shall be in accordance with Table 10.

Justification

This requirement ensures that there is a minimum difference of 20 Brinell between the groove and the gasket.

Add new Table 10

Table 10—Minimum Brinell Hardness of Grooves of Ring Type Joint Flanges

Flange Material	Gasket Material	Minimum Brinell Hardness
Carbon steel	—	110 HB
Alloy steel (3.5 % Ni)	316L stainless steel	180 HB
Alloy steel (2.25 % Cr, 1 % Mo)	Alloy steel (5 % Cr, 0.5 % Mo)	150 HB
Austenitic stainless steel	316L stainless steel	180 HB
Duplex stainless steel	316L stainless steel	190 HB
Alloy 625	UNS N06625	220 HB

Justification

This table ensures that there is a minimum difference of 20 Brinell between the groove and the gasket.

Add to section

Bolting bearing surfaces shall be spot faced or back faced in accordance with MSS SP-9.

Justification

This requirement ensures proper load distribution, gasket sealing integrity, bolt load transfer and overall reliability of flange joints.

5.3.1.2

Delete "or ISO 5752" from first sentence

Justification

This requirement ensures standardization of face-to-face dimensions to ASME B16.10 which is the industry default. Additionally, ISO 5752 does not include dimensions for DN 850 (NPS 34).

Add to section

Face-to-face dimensions shall be in accordance with Table 11.

NOTE For combinations of valve size and class not included in Table 11, see Annex H.

Justification

This requirement ensures standardization of face-to-face dimensions for size and rating combinations that are excluded from ASME B16.10 scope.

Add new Table 11

Table 11—Face-to-face Dimensions

Valve Size DN (NPS)	Class 150 mm (in.)	Class 300 mm (in.)	Class 600 mm (in.)
1000 (40)	As per ASME B16.10	1930 (76)	2286 (90)
1050 (42)	787 (31)	1981 (78)	2438 (96)
1200 (48)	864 (34)	2235 (88)	2540 (100)
1270 (50)	—	—	2540 (100)
1321 (52)	1000 (40)	—	—
1372 (54)	1050 (42)	—	—
1422 (56)	—	2438 (96)	2692 (106)

Justification

This table ensures standardization of face-to-face dimensions for size and rating combinations outside of ASME B16.10 scope.

Add new section

5.3.1.3 Lateral Misalignment

5.3.1.3.1

For valve sizes DN 100 (NPS 4) and below, the lateral misalignment of flange centerlines shall not exceed 2 mm (0.079 in.).

Justification

This requirement ensures standardization of the maximum lateral misalignment of flange centerlines, aligning with API 6D.

5.3.1.3.2

For valve sizes above DN 100 (NPS 4), the lateral misalignment of flange centerlines shall not exceed 3 mm (0.118 in.).

Justification

This requirement ensures standardization of the maximum lateral misalignment of flange centerlines, aligning with API 6D and IOGP S-562.

Add new section

5.3.1.4 Parallel Misalignment

5.3.1.4.1

For valve sizes DN 600 (NPS 24) and below, the parallel misalignment between flanges shall not exceed 2.5 mm/m (0.03 in./ft).

Justification

This requirement ensures standardization of the maximum parallel misalignment between flanges, aligning with API 6D.

5.3.1.4.2

For valve sizes above DN 600 (NPS 24), the parallel misalignment between flanges shall not exceed 1.75 mm/m (0.02 in./ft).

Justification

This requirement ensures standardization of the maximum parallel misalignment between flanges, aligning with API 6D.

Add new section

5.3.1.5

Valves with flanged ends shall accommodate, without contacting other body parts, heavy hex series nuts with dimensions in accordance with ASME B18.2.2.

Justification

This requirement ensures that only ASME B18.2.2 nuts are permitted for use in ASME B31.3 piping system.

5.3.2 Butt-welding Ends

5.3.2.2

Add to section

For valve sizes not listed in ASME B16.10, end-to-end dimensions shall be as specified in the PDS.

Justification

This requirement defines the responsibility for face-to-face dimensions not covered by ASME B16.10 and sizes beyond API 600 scope.

5.3.2.3

Add new list section

— the sulfur content of carbon steel welding ends shall not exceed 0.020 % by mass;

Justification

This requirement prevents the reduction of intergranular strength and melting point of steel, crack formation due to sulfides that can lead to fatigue failure, embrittlement of steel and reduction of weldability which can be caused by a high sulfur content in steel.

Add new list section

— the phosphorus content of carbon steel welding ends shall not exceed 0.025 % by mass.

Justification

This requirement ensures that steel does not deteriorate its cold working ability and weldability due to phosphorus at low temperatures making steel significantly brittle, a phenomenon known as "cold brittleness". The higher the phosphorus content is, the more severe the cold brittleness is.

Add new section

5.3.2.5 Pup Pieces

5.3.2.5.1

Outside diameter, wall thickness, material grade and composition of the extension (pup) pieces shall be as specified.

Justification

This requirement ensures that the parameter details of extension (pup) pieces are met.

5.3.2.5.2

When specified, butt-welded end valves shall be provided with extension pup pieces in accordance with Table 12.

Justification

This requirement promotes standardization of the lengths of pup pieces.

Add new Table 12

Table 12—Pup Lengths

Valve Size DN (NPS)	Pup Length mm (in.)
50 to 200 (2 to 8)	200 mm (8 in.)
250 to 500 (10 to 20)	Minimum 1*D* and maximum 500 mm (20 in.)
≥ 550 (≥ 22)	800 mm (32 in.)
Key *D* is the outside diameter of the pipe.	

Justification

This table promotes standardization of the lengths of pup pieces.

5.3.2.5.3

The material grade of the pup piece shall be greater than or equal to that of the valve body or the associated piping/pipeline.

Justification

This requirement ensures that the material grade specified is suitable for the same service conditions for which the valve is designed. This removes the risk of the pup piece not being fit for purpose for the conditions in which it is installed, resulting in a safety incident.

5.3.2.5.4

An additional piece (e.g., test ring) made of the same material as that of the extension pup pieces shall be provided.

Justification

This requirement ensures a level of confidence for site welding as the test piece used for the welding qualification gives a true representation of the extension pup pieces.

5.3.2.5.5

Final assembly and leak testing of the valve shall be performed after welding and heat treatment of extension pup pieces.

Justification

This requirement mitigates the risk of damage to valve seals that can result in the failure of leak testing.

5.3.2.5.6

The ratio of the minimum yield strength of the extension pup piece material to the valve body material or extension pup piece to the pipe shall not exceed 1.5:1.

Justification

This requirement prevents abrupt changes in thicknesses during welding, preventing the risk of high stress intensification.

5.3.2.5.7

Where the specified minimum yield strength of the adjoining pipe material exceeds the specified minimum yield strength of the valve material by more than 1.5:1, the extension pup piece shall be of an intermediate strength so that the maximum yield strength ratio of 1.5:1 across the valve to extension pup piece weld and extension pup piece to the pipe weld is satisfied (e.g., the extension pup piece between an ASTM A350 LF2 valve and an API 5L X60 pipeline may be of ASTM A694 F52 / API 5L X52 material).

Justification

This requirement prevents abrupt changes in thicknesses during welding, preventing the risk of high stress intensification.

5.3.2.5.8

The extension pup piece material shall be in accordance with the applicable IOGP S-563 MDS.

Justification

This requirement promotes standardization of material requirements for extension pup pieces in accordance with IOGP S-563.

5.3.2.5.9

The end preparation and alignment of extension pup pieces shall be in accordance with ASME B31.3 or, when specified, an alternative specification.

Justification

This requirement ensures the prevention of mismatched end preparations which can result in the inability to install the valve correctly.

5.3.2.5.10

Heat-treatment delivery conditions shall be marked on the extension pup piece using a low-stress die stamp.

Justification

This requirement mitigates the risk of the incorrect installation of the valve due to the lack of information on the heat treatment condition of the extension pup pieces.

5.4 Bonnet

5.4.2

Add to first list item

or on attachment by tack welding

Justification

This requirement ensures that the term "positively secured" does not include tack welding.

5.4.4

Add to section

The eyebolt pin shall not be anchored by split pins or cotter pins.

Justification

The use of split pins and cotter pins in vibrating services can lead to unanchoring of the eyebolt pin, which can result in leakages.

Add new section

5.4.6 Lagging

When applicable, lagging extension lengths shall be specified.

NOTE Suggested dimensions for lagging requirements are provided in Annex G.

Justification

This requirement ensures that bonnet bolting is outside the lagging and that any potential leakage is visible.

5.5 Bonnet-to-body Joint

Add new section 5.5.0 before section 5.5.1

5.5.0

Flanges with a circular or a non-circular shape shall have a flange facing finish in accordance with ASME B16.5.

Justification

This requirement ensures appropriate flanges sealing.

5.5.1

Add to sentence

as specified

Justification

This addition ensures that the bonnet-to-body joint is specified.

5.5.4

Add to section

The hardness of ring-joint gaskets shall be at least 30 HBW less than the hardness of the body/bonnet sealing surfaces.

Justification

This requirement ensures that the gasket deforms to provide a suitable seal.

5.5.7

Add to section

Bolting bearing surfaces shall be spot faced or back faced in accordance with MSS SP-9.

Justification

This requirement ensures proper load distribution, gasket sealing integrity, bolt load transfer and overall reliability of flange joints.

Add new section

5.5.12 Bolting

5.5.12.1

The bolting preload shall not be less than the calculated bolt load required to seal under hydrostatic test conditions.

Justification

This requirement prevents bolts stretching beyond yield which will cause permanent deformation and gasket leak.

5.5.12.2

The bolt stress resulting from preload shall not exceed 70 % of yield at the design temperature.

Justification

This requirement provides an upper limit for variability in bold stress by torquing, which ensures the prevention of overstressing the bolt.

5.5.12.3

Bolting preload torques calculations shall be in accordance with API 6A, ASME PCC-1 or EN 1591 (all parts).

Justification

This requirement ensures that bolt torques used are in accordance with the target bolt stress required.

5.5.12.4

Bolting lubricant for bolting preload torque calculations shall have the same coefficient of friction on the threads and nut face as the one used in production.

Justification

This requirement ensures that the calculated bolting preload torque provides a suitable torque value that is aligned with the type of lubricant to be used.

5.6 Gate

5.6.1

5.6.1.1

Add to section

Valves DN 50 (NPS 2) and above shall be furnished with a flexible wedge.

Justification

This requirement ensures standardization and prevents valve malfunctions and performance issues.

5.6.3

In second paragraph, replace "DN 650 (NPS 26)" with

DN 300 (NPS 12)

Justification

This requirement ensures the prevention of galling and jamming of wedge and body guides. The size has been reduced to start from DN 300 (NPS 12) based on industry experience.

5.7 Yoke

5.7.3

Add to section

Separate yokes shall be attached to the bonnet with studs and nuts using through holes.

Justification

This requirement ensures that a robust method is used for the attachment of the yoke.

Add to section

Separate yokes shall not be attached to the bonnet using slotted holes.

Justification

This requirement ensures that a robust method is used for the attachment of the yoke.

Table 3—Minimum Wear Travel and Maximum Stem Projection

Add rows "1100 ≤ DN ≤ 1200 (44 ≤ NPS ≤ 48)" and "1250 ≤ DN ≤ 1500 (50 ≤ NPS ≤ 60)"

Valve Size Range, DN (NPS)	Minimum Wear Travel, *h* mm (in.)	Maximum Stem Projection mm (in.)
1100 ≤ DN ≤ 1200 (44 ≤ NPS ≤ 48)	25.4 (0.96)	76.2 (3)
1250 ≤ DN ≤ 1500 (50 ≤ NPS ≤ 60)	32.0 (1.25)	96.0 (3.78)

Justification

This addition ensures standardization for larger valve sizes.

5.8 Stem and Stem Nut

5.8.1

Add to section

Stem sections shall be cylindrical, within a tolerance of 0.05 mm (0.002 in.).

Justification

This requirement ensures that tolerances for valve stems are maintained for all valves including those that are not subject to the fugitive emission type testing. This requirement also ensures that packing provides optimal sealing and prevents fugitive emissions.

Add to section

Out of straightness of the entire length of the valve stem shall not exceed 0.4 mm/m (0.005 in./ft).

Justification

This requirement ensures that tolerances for valve stems are maintained for all valves including those that are not subject to the fugitive emission type testing. This requirement also ensures that packing provides optimal sealing and prevents fugitive emissions.

5.8.7

Add to section

The stem-to-gate connection of the valve shall be in accordance with the strength requirements of API 591:2019, Annex B.

Justification

This requirement ensures standardization of the practice used to qualify stem-to-gate connection strength requirements.

5.9 Packing and Packing Box

5.9.1

Add to section

The stem packing arrangement shall prevent extrusion.

Justification

This requirement ensures the prevention of valve failure and potential safety incidents.

Add to section

The packing shall consist of die-formed, exfoliated graphite rings with anti-extrusion braided end (top and bottom) rings or fully braided packing set in accordance with Figure 5 and Figure 6.

Justification

This requirement ensures standardization of the recognized industry practice for the type and arrangement of valve stem packing to ensure sealing.

Add to section

The bottom of the packing box shall be flat and perpendicular to the axis of the stem.

Justification

This requirement ensures proper installation of the packing removing the risk of fugitive emission leaks.

Add new Figure 5

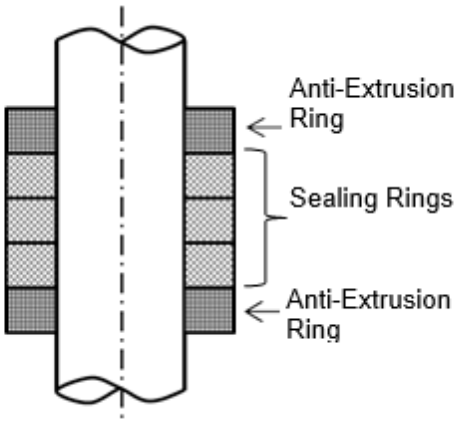

Figure 5—Die-Formed Flexible Graphite Packing

Justification

This figure ensures standardization of the recognized industry practice for the type and arrangement of valve stem packing to ensure sealing.

Add new Figure 6

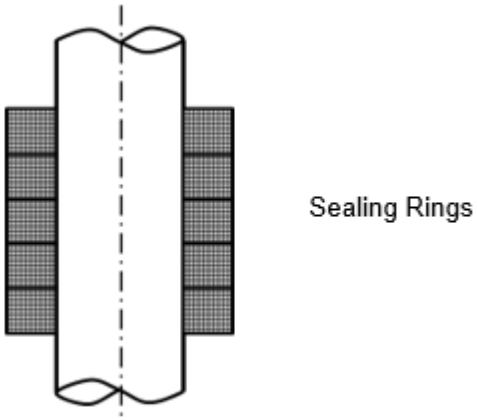

Figure 6—All Braided Graphite Rings Packing

Justification

This figure ensures standardization of the recognized industry practice for the type and arrangement of valve stem packing to ensure sealing.

5.9.4

Add to section

The packing gland shall protrude into the stuffing box by at least 1 mm (0.04 in.) prior to compressing the packing rings.

Justification

This requirement ensures the alignment of the gland flange. If the gland flange is not correctly aligned, it can lead to leakage, valve failure and other safety incidents.

Add to section

Threaded glands shall not be used.

Justification

This requirement ensures that the packaging is not damaged by threads, preventing leakage, valve failure and other safety incidents.

Add to section

The gland flange shall be constructed from a single piece of material.

Justification

This requirement ensures the prevention of any risk of loss of integrity due to a multipiece gland flange design.

5.9.6

Add to section

The stem shall be supported and have clearances to prevent rubbing contact with the adjacent static metallic components in any orientation.

Justification

This requirement ensures that the stem is supported to minimize deflection from high temperatures and mechanical loading forces and prevents the misalignment of the valve stem.

5.11 Operation

5.11.1

Add to section

The handwheel or gearbox of the valve shall operate against an MPD equal to the full pressure rating at 38 °C (100 °F).

Justification

This requirement ensures that valves are operable in all process conditions related to the defined pressure class of valves (e.g., class 900).

Add to section

When requested, the manufacturer shall provide the following data:

— number of turns for manually operated valves;

— valve top work details for interlock design.

Justification

This requirement provides additional information required in certain applications.

Add to section

The rim pull force required to seat, unseat and stroke at the MPD at the minimum and maximum design temperatures shall not exceed 360 N (80 lbf).

Justification

This requirement ensures standardization of the maximum rim pull force allowed and aligns with API 6D.

Add to section

If the force or dimensional limitations are exceeded on directly installed handwheel, the valve shall be provided with a gearbox.

Justification

This requirement ensures that the handwheel rim pull force does not exceed 360 N and that dimension limitations are maintained.

Add to section

Valves with bore sizes greater than or equal to those specified in Table 13 shall be fitted with a gearbox.

Justification

This requirement provides standardization of minimum bore sizes at which a gearbox is required.

Add new Table 13

Table 13—Minimum Bore Sizes at which a Gearbox is Required

Class	Valve Bore Size at which a Gearbox is Required DN (NPS)
150	≥ 300 (12)
300	≥ 250 (10)
600	≥ 150 (6)
900	≥ 100 (4)
1500 and 2500	≥ 80 (3)

Justification

This table provides standardization of minimum bore sizes at which a gearbox is required.

5.11.2

Add to section

Handwheel spokes shall not extend beyond the perimeter of the handwheel.

Justification

A protruding handwheel spoke can be unintentionally touched by the operator and/or catch items of clothing. This requirement ensures the prevention of such safety incidents. Also, handwheel spokes offer no technical advantage.

Add to section

Handwheel dimensions for class 300 and above valves shall not exceed the end to end dimensions or 750 mm (30 in.), whichever is smaller.

Justification

This requirement ensures the prevention of handwheel clash when two valves are connected in series.

Add to section

Handwheel dimensions for class 150 valves shall not exceed twice the end-to-end dimensions or 750 mm (30 in.), whichever is smaller.

Justification

This requirement allows for piping design progression without the risk of handwheel clashes.

Add new section

5.11.7

5.11.7.1

The maximum output torque/force of the direct-mounted handwheel or gearbox shall be calculated applying a 360N (80 lbf) input rim pull force.

Justification

This requirement prevents the stem from being stressed beyond its yield and resulting in a valve failure.

5.11.7.2

The drive train shall withstand the maximum output force of the actuator, gearbox or directly-mounted handwheel without permanent deformation.

Justification

This requirement prevents the stem from being stressed beyond its yield and resulting in a valve failure.

Add new section

5.11.8 Gearboxes

5.11.8.1

The IEC 60529 IP code for gearboxes shall be IP65.

Justification

This requirement ensures alignment with API 6DX for IEC 60529 IP65 protection class which requires having full protection against dust, particles similar to dust and low-pressure water jets.

5.11.8.2

Gearboxes shall be filled with grease (extreme pressure type (EP type) or equivalent) or heavy-duty gear oil to a minimum of 80 % with all moving parts submerged.

Justification

This requirement ensures smooth operability of the gearbox.

5.11.8.3

External shafts shall be made of corrosion-resistant material.

Justification

This requirement ensures that corrosion of the shaft caused by environmental conditions is mitigated to prevent gearbox failure. The shaft is always exposed to the environment and is not a part that is easy to replace.

5.11.8.4

Gearboxes shall allow for the handwheel to be orientated on site at any 90° increment relative to the initial position supplied.

Justification

This requirement ensures that the handwheel orientation can be modified on site.

5.11.8.5

The operating temperature for the gearbox, if not specified, shall be between -20 °C and 80 °C (-4 °F and 176 °F).

Justification

This requirement ensures that suitable lubrication is supplied for the gearbox as incorrect lubrication may lead to gearbox failure.

5.11.8.6

The dimensions of the gearbox shall not exceed the valve end-to-end dimensions for classes 300 and above.

Justification

This requirement allows for piping design progression without the risk of handwheel clashes.

5.11.8.7

Gearboxes dimensions for class 150 valves shall not exceed twice the valve end-to-end dimensions.

Justification

This requirement allows for piping design progression without the risk of handwheel clashes.

5.11.8.8

Gearbox handwheel diameters shall not exceed the dimensions specified in 5.11.2.

Justification

This requirement allows for piping design progression without the risk of handwheel clashes.

5.11.8.9

When the number of handwheel turns on a gear operator exceeds 100 from the fully open to the fully closed position, the number of handwheel turns shall be specified in the quotation.

Justification

This requirement ensures that a review of the valves can be undertaken to determine whether the valve type should be changed or alternative means of operation should be included to prevent lengthy opening/closing times of the valve. Alternative means of operation may be an actuator or a square nut for use with a hand-held power drive or hand-crank type handwheel.

5.11.8.10

Gearboxes shall be equipped with one or more easily accessible injection fittings and a weatherproof vent connection.

Justification

This requirement ensures long term lubrication application, preventing gearbox failure due to the lack of lubrication. This also permits easy packing on site and lubrication of rotating shafts penetrating the gearbox.

5.12 Bypasses and Other Auxiliary Connections

Add to section

The bypass shall be located on the side of the valve connecting the A-B or the E-F locations in accordance with ASME B16.34:2020, Figure 1.

Justification

This requirement ensures standardization of available connection points for bypass connections and aligns with ASME B16.34.

Add to section

The bypass valve shall be of rising stem outside screw and yoke globe valve type in accordance with API 602.

Justification

This requirement ensures controlled operation when using the bypass. The use of a globe valve for bypass equalization is a recognized industry practice.

Add to section

The bypass valve stem shall have the same general orientation as the primary valve stem.

Justification

This requirement ensures standardization of the bypass valve stem orientation.

5.13 Fugitive Emission Design Requirement

5.13.1

Add to sentence

and ISO 15848-1

Justification

This requirement ensures an alternative option as API 624 uses methane for testing which some end users view as a safety risk.

Add to section

When specified, Annex I shall be normative.

Justification

This requirement clarifies that if specified, informative Annex I becomes normative.

Add to section

The fugitive emission type testing standard, method, tightness class and acceptance criteria shall be specified.

Justification

This requirement ensures flexibility for fugitive emission testing whose requirements can vary depending on end user preferences.

Add to section

Type testing to requirements of ISO 15848-1 or Annex I shall be in accordance with performance class ISO FE BH CO1 SSA1 for the designed temperature range.

Justification

This requirement ensures a minimum standard of performance class.

Add new section

5.14 Lifting

5.14.1

Lifting sketches and handling instructions for safe lifting operation for valves and valve assemblies weighing at least 25 kg (55 lbs) shall be provided.

Justification

This requirement ensures that the valve is lifted safely, preventing any risk of damage to the valve or of safety incidents while personnel are performing lifting operations. The weight of 25 kg and above aligns with API 6D.

5.14.2

The weight of the valve shall be indicated on the lifting sketch.

Justification

This requirement ensures that installation personnel are provided with necessary information to allow for safe handling and installation of the valve.

5.14.3

Lifting lugs shall be provided for valves weighing more than 250 kg (550 lbs) including the operator and accessories.

Justification

This requirement ensures standardization of the weight for when lifting lugs are required.

5.14.4

When provided, lifting lug positions shall be based on the stem in the vertically up position and the specified installation orientation.

Justification

This requirement ensures that valves can be handled with the stem in the vertically up position, which is a recognized industry practice.

5.14.5

Lifting lugs shall not be made of cast iron or ductile iron material.

Justification

This requirement ensures the prevention of fracture due to shock loading to which iron is susceptible to due to its low fracture toughness.

5.14.6

Carbon steel lifting points shall not be used on corrosion-resistant (e.g., 316 stainless steel) valve bodies.

Justification

This requirement ensures the prevention of connections of dissimilar materials and risk of galvanic corrosion which would result in the failure of the lifting lug.

5.14.7

Valves shall be marked to indicate the mandatory safe lifting points and lifting lug SWL.

Justification

This requirement provides installation personnel with the information to allow for safe handling and installation of the valve.

6 Materials

6.1 Materials Other Than Trim Materials

Add new section

6.1.1

6.1.1.1

The material designation (e.g., ASTM) and material grade of all valve parts shall be provided.

Justification

This requirement ensures clarity on the materials used and allows for a comprehensive review of the bill of materials on the general arrangement drawing.

6.1.1.2

Bolting and valve components shall not be cadmium plated.

Justification

This requirement prevents safety and environmental risks related to the use of cadmium.

6.1.1.3

Austenitic ductile iron stem nuts shall not be used in combination with austenitic stainless steel stem materials.

Justification

This requirement prevents the risk of galling of the stem which can lead to leakage and valve failure.

6.1.1.4

The gearbox or actuator including the mounting bracket shall be capable of operating at an atmospheric temperature of -20 °C to 80 °C (-4 °F to 176 °F).

Justification

This requirement prevents the failure of the gearbox or mounting bracket in extreme weather conditions.

Add new section

6.1.2

6.1.2.1

Trim components not listed in Table 7 shall have a corrosion resistance greater than or equal to that of the component to which they are coupled.

Justification

This requirement ensures that materials selected for wetted components are suitable for service conditions.

6.1.2.2

Trim components not listed in Table 7 shall have an allowable temperature range greater than or equal to that of the component to which they are coupled.

Justification

This requirement ensures that materials selected for wetted components are suitable for service conditions.

Add new section

6.1.3

When sour service is specified, valve components shall be in accordance with ANSI/NACE MR0103/ISO 17945 or ANSI/NACE MR0175/ISO 15156.

Justification

This requirement ensures that the material specified is suitable for sour service.

Add new section

6.1.4

Spiral wound gaskets with PTFE filler material shall be in accordance with ASTM D4894 or ASTM D4895.

Justification

This requirement ensures standardization with recognized industry standards for PTFE filler material.

Add new section

6.1.5

Austenitic stainless steel gaskets (spiral wound or ring joint) shall be in the solution-annealed condition.

Justification

This requirement ensures the integrity of the gasket and its ability to seal in severely corrosive applications, preventing potential leakages.

6.2 Trim

Add new section

6.2.3

Stem, sliding elements and threaded components shall have hardness differences between contacting surfaces or surface treatment.

NOTE The required differential hardness to prevent galling varies depending on materials. A 50 HBW differential hardness is considered a general recommended practice.

Justification

This requirement ensures the prevention of galling and potential valve leakages.

Add new section

6.3 Welding

6.3.1

Welding, including repair welding, of pressure-containing and pressure-controlling parts shall be performed in accordance with procedures qualified to ASME BPVC, Section IX or ISO 15607, ISO 15609 (all parts), and ISO 15614-1.

Justification

This requirement ensures standardization with industry recognized acceptable welding procedures and aligns with API 600.

6.3.2

Heat treatment shall be performed in accordance with IOGP S-563 MDSs.

Justification

This requirement ensures that IOGP S-563 MDSs are used for heat treatment procedures, promoting standardization.

6.3.3

Butt welds shall be of the full penetration type.

Justification

This requirement prevents the use of partial penetration welds which have a higher risk of failure. This is a recognized industry practice.

6.3.4

Weld procedure qualification for ferritic-austenitic (duplex and super duplex) stainless steel shall include microstructural examination including ferrite measurement, impact testing and corrosion testing in accordance with ISO 17781.

Justification

This requirement ensures further qualification of correct material properties for duplex and super duplex materials when the purchaser deems it required based on its proposed application. Below standard duplex and super duplex material properties can cause valve failure.

Add new section

6.4 Graphite Materials

6.4.1

Die-formed rings, flexible graphite and spiral wound gaskets with graphite filler shall be in accordance with ASTM F2168 Class 2 with supplementary requirements S3.1, S6.1, S6.2 and S10 included.

Justification

This requirement ensures standardization of graphite compliance with industry standards. This requirement prevents the use of below standard graphite which can lead to valve failure.

6.4.2

Braided yarn shall be in accordance with ASTM F2191/F2191M Class 2 with supplementary requirements S6.1 and S10 included.

Justification

This requirement ensures standardization of compliance with industry standards.

6.4.3

Active sacrificial corrosion inhibition using zinc shall not be permitted.

Justification

This requirement prevents valve failure due to liquid metal embrittlement of austenitic stainless steel components in case of fire in high-temperature service.

6.4.4

The chlorine content shall be less than or equal to 50 ppm.

Justification

This requirement prevents the risk of pitting corrosion and stress corrosion cracking.

6.4.5

The fluorine content shall be less than or equal to 10 ppm.

Justification

This requirement prevents the risk of pitting corrosion and stress corrosion cracking.

6.4.6

The halogen content shall be less than or equal to 310 ppm.

Justification

This requirement prevents the risk of pitting corrosion and stress corrosion cracking.

6.4.7

Graphite oxidation testing shall be performed in accordance with EN 14772:2021, 6.7 or FSA-G-604-07.

Justification

This requirement ensures graphite durability when the material is exposed to a high temperature or an oxidizing environment.

6.4.8

The accumulated weight loss during graphite oxidation testing shall be less than 4 % per hour.

Justification

This requirement ensures graphite durability when the material is exposed to a high temperature or an oxidizing environment.

7 Testing, Inspection, and Examination

7.1 Inspection and Examination

7.1.1

Replace section with

Valves shall be inspected and examined for compliance in accordance with the specified QSL.

Justification

This requirement ensures that the supplier completes inspection, testing and examination in line with the assigned QSL.

7.1.2

Add to sentence

with the amendments specified in Annex F

Justification

This addition ensures compliance with the requirements of Annex F.

7.2 Pressure Test

Add to sentence

with the amendments specified in Annex F

Justification

This addition ensures compliance with the requirements of Annex F.

Add to section

Chloride content of test water in contact with the austenitic and duplex stainless steel components of the valve shall not exceed 30 ppm.

Justification

This requirement ensures the integrity of stainless steel components in case of any left over water post hydrotesting, which leads to higher concentration of chloride which can cause potential damage. This aligns with API 6D.

7.3 Repairs of Defects

Add to section

Weld repair of materials shall be in accordance with the applicable IOGP S-563 MDSs.

Justification

This requirement ensures standardization of weld repairs as per IOGP-S-563.

Add to section

Weld repair of materials that are not covered in IOGP S-563 MDSs shall not be permitted without purchaser approval.

Justification

This requirement ensures that the gap when there is no applicable MDS is covered.

Add to section

Weld repairs shall not be permitted for pressure-containing castings that leak during pressure testing.

Justification

This requirement prevents valve failure due to the use of poor quality castings.

Add to section

Weld repairs shall be inspected in accordance with Annex F and the standard used for the component inspection.

Justification

This requirement ensures standardization of weld repairs to the approved practices.

Add to section

Weld repair of forgings, plates, seamless products and bars shall not be permitted.

Justification

As per IOGP S-563, weld repair of forgings, plates, seamless products and bars is not permitted. This requirement ensures alignment of this with materials not covered by IOGP S-563.

Add to section

Additional weld repairs shall not be allowed on areas that have undergone major weld repair.

Justification

This requirement ensures that valves of poor casting are rejected rather than repeatedly repaired.

Add new section

7.4 Repairs of Weld Overlay and Hard Facing

7.4.1

Weld repair of corrosion-resistant weld overlay and hard facing shall be in accordance with the applicable IOGP S-563 EDS referenced in Annex D.

Justification

This requirement ensures standardization of weld repairs of CRA overlay and hard facing as per IOGP S-563.

7.4.2

Weld repair of corrosion-resistant weld overlay and hard facing that are not covered in IOGP S-563 MDSs shall not be permitted without purchaser approval.

Justification

This requirement ensures that the gap when there is no applicable MDS is covered.

Add new section

7.5 Major Weld Repairs

Major weld repairs shall not be permitted without purchaser approval prior to the execution.

Justification

This requirement ensures informed decision making and evaluation prior to major repairs are performed.

Add new section

7.6 Production Testing

7.6.1

When production valve testing is specified, a sample of the manufactured valves shall be subjected to fugitive emission production testing in accordance with ISO 15848-2 or, if agreed with the purchaser, another standard.

Justification

This requirement ensures flexibility for fugitive emission production testing depending on end user preferences.

7.6.2

No adjustment shall be made to stem packing and gland flange bolts after final production testing.

Justification

This requirement prevents overtightening of the packing gland, which can affect the operability of the valve.

7.6.3

When the valve is tested in accordance with ISO 15848-2 or Annex J, if the tightness class is not specified, class B shall be the minimum.

NOTE When specified, see Annex J for additional requirements to ISO 15848-2.

Justification

This requirement ensures a minimum standard of tightness class.

Table 8—Nominal Seating Surface, Stem and Backseat Bushing or Weld-deposit Materials and Hardness

Add row "22A" and row "22B"

Trim	Nominal Trim	Seating Surface Hardness (HB) Minimum [a]	Seating Surface Material Type [b]	Seating Surface Typical Specifications Grade			Stem/Backseat Bushing [p]		Stem Hardness (HB)	Backseat Bushing Hardness (HB)
				Cast (Integral)	Forged (Integral)	Welded [m]	Material Type [b]	Typical Specifications Type		
22A	Duplex	Note [d]	22Cr	ASTM A995 Gr. 4A	ASTM F51	AWS 5.9 ER2209 or ER2553	22Cr	ASTM A276 UNS S31803	Note [d]	Note [d]
22B	Super duplex	Note [d]	25Cr	ASTM A995 Gr. 6A	ASTM F53 or F55	AWS 5.9 ER2594	25Cr	ASTM A276 UNS S32750 or S32760	Note [d]	Note [d]

Justification

This addition ensures an expanded material selection choice as API 600 does not cover duplex and super duplex trim options.

8 Marking

8.1 General

Add to section

The nameplate shall include the designation "IOGP S-611".

Justification

This requirement ensures that the valve is visibly identified as conforming to this specification.

Add to section

The nameplate letter size shall be at least 3 mm (0.12 in.).

Justification

This requirement ensures standardization of the minimum letter size and aligns with API 6D.

Add to section

Nameplate rivet holes, when applicable, shall be drilled prior to valve testing.

Justification

This requirement prevents the risk of damage to the integrity of the valve by drilling rivet holes in the nameplate.

Add to section

The letter size height for markings on the body closure/end connector and bonnet/cover shall be at least 4 mm (0.16 in.).

Justification

This requirement ensures that markings are legible.

Add to section

Markings on the body and the bonnet shall not be masked by painting or coating.

Justification

This requirement prevents markings from being illegible.

Add to section

If specified, an austenitic stainless-steel nameplate shall be provided for the gear operator.

Justification

This requirement ensures the longevity of the gear operator nameplate.

8.2 Specific Markings

8.2.1

Add to section

For valves that have a body cavity relief, "HP" for "high pressure" shall be permanently marked on the high-pressure side (in the closed position) of the unidirectional valve body.

Justification

This requirement prevents the installation of the valve in the wrong direction.

9 Preparation for Shipment

9.1 Coatings

9.1.1

Add to section

Pure cadmium or zinc coatings shall not be used.

Justification

This requirement prevents liquid metal embrittlement with stainless steel which can lead to valve failure.

Add new section

9.1.3

External coatings for end connections shall be in accordance with API 6D:2021, Annex G.

Justification

This requirement ensures that sealing surfaces of valves ends are not covered with an external coating that can affect sealing and lead to leakages.

9.5 Packaging

Add new section 9.5.0 before section 9.5.1

9.5.0 Packing Preparation

9.5.0.1

Prior to shipment, valve internals shall be cleaned and dried.

Justification

This requirement prevents internal damage to the valve due to particles and fluids during transit and storage.

9.5.0.2

Internal surfaces of the valve shall be free from cleaning agents, loose particles and organic substances.

Justification

This requirement prevents internal damage to the valve due to particles and fluids during transit and storage.

Add new section

9.5.3

Valves shall be packed in an enclosed vapor-proof barrier material.

Justification

This requirement ensures that no moisture can interfere with the integrity of the valves.

Add new section

9.5.4

Valve packaging shall have VPCIs applied in accordance with the VPCI manufacturer's instructions.

Justification

This requirement ensures that no moisture interferes with the integrity of the valves.

Annex B
(normative)

Information to be Specified by the Purchaser

In list section 2), add new list items cc) to kk)

cc) fugitive emission type testing standard, testing method and tightness class;

dd) fugitive emission production testing size of the sample, selection method, test method and acceptance criteria;

ee) QSL;

ff) lagging extension;

gg) optional requirements selected from Annex G;

hh) body cavity relief;

ii) minimum and maximum design temperature;

jj) wall thickness and inner diameter of the mating pipe;

kk) material requirement alternatives to IOGP S-563 MDSs.

Justification

This requirement ensures that the supplier has received all relevant information to provide the valve.

Annex D
(normative)

Valve Material Combinations

Add to annex

When a material has a corresponding MDS in IOGP S-563, the requirements of that MDS shall apply.

Justification

This requirement ensures standardization of material requirements.

Add to annex

When a weld overlay material, including hardfacing, has a corresponding EDS in IOGP S-563, the requirement of that EDS shall apply.

Justification

This requirement ensures standardization of material requirements.

Add to annex

Alternative material requirements shall be permitted when specified in the purchasing documents.

Justification

This requirement ensures that the purchaser can specify alternative material requirements when necessary.

Add new Annex F

Annex F
(normative)

Supplementary Requirements for Inspection and Testing

F.1 General

F.1.1

This annex specifies quality levels for gate valves.

Justification

This guidance text is the scope of this annex.

F.1.2

QSL1 is the default quality level.

Justification

This is guidance text on how to adhere to QSLs.

F.1.3

QSL2 to QSL4 are optional and may be specified.

NOTE The QSL defines the extent of inspection and testing to be undertaken by the manufacturer. The QSL is selected on the basis of service risk, with the QSL number increasing with the extent of inspection and testing required.

Justification

This is guidance text on how to adhere to QSLs.

F.2 Inspection and Examination

F.2.1

NDE activities shall be conducted after final heat treatment or post-weld heat treatment.

Justification

This requirement prevents defects increasing in magnitude with heat treatment.

F.2.2

F.2.2.1

A ferrite content check shall be performed on duplex and super duplex stainless steel welds supplied in the as-welded condition (e.g., welds between duplex / super duplex extension pup pieces and valve bodies).

Justification

This requirement ensures the corrosion resistance of duplex and super duplex stainless steel, preventing the use of below standard materials which can lead to valve failure.

F.2.2.2

The ferrite percentage range shall be measured using a calibrated ferrite content meter.

Justification

This requirement ensures the corrosion resistance of duplex and super duplex stainless steel, preventing the use of below standard materials which can lead to valve failure.

F.2.2.3

The ferrite content meter shall be calibrated in accordance with AWS A4.2M or ISO 8249.

Justification

This requirement ensures standardization of the calibration method.

F.2.2.4

Calibration blocks shall cover ferrite within the range of 25 % to 70 %.

Justification

This requirement ensures the corrosion resistance of duplex and super duplex stainless steel, preventing the use of below standard materials which can lead to valve failure.

F.2.2.5

Ferrite checks shall be undertaken on the OD at a minimum of three locations equally spaced around the circumference.

Justification

This requirement ensures the corrosion resistance of duplex and super duplex stainless steel, preventing the use of below standard materials which can lead to valve failure.

F.2.2.6

Coatings and surface oxide shall be removed prior to testing.

Justification

This requirement ensures the corrosion resistance of duplex and super duplex stainless steel, preventing the use of below standard materials which can lead to valve failure.

F.2.2.7

The test locations shall be ground to a minimum 120-grit finish prior to testing.

Justification

This requirement ensures the accuracy of test readings. A rough surface may give a less accurate reading.

F.2.2.8

For welds in the as-welded condition, the acceptance criteria for the ferrite content shall be within the range of 30 % to 70 % in accordance with ISO 17781.

Justification

This requirement ensures the corrosion resistance of duplex and super duplex stainless steel, preventing the use of below standard materials which can lead to valve failure.

F.2.3

F.2.3.1

NDE personnel shall be qualified in accordance with ISO 9712 or ASNT SNT-TC-1A.

Justification

This requirement ensures that NDE personnel are suitably qualified to a recognized standard.

F.2.3.2

Personnel performing NDE evaluation shall be certified ISO 9712 or ASNT SNT-TC-1A Level 2.

Justification

This requirement ensures that NDE personnel have the necessary knowledge and skills to perform NDE evaluation and are certified by a recognized organization in accordance with a centrally administered certification scheme.

F.2.4

NDE requirements shall be in accordance with Table F.1.

Justification

This requirement ensures the use of Table F.1.

F.2.5

The extent, method and acceptance criteria of NDE and the item examination code shall be in accordance with Table F.2.

Justification

This requirement ensures the use of Table F.2.

F.2.6

Visual examination after assembly shall include dimensional inspection of the following:

— end-to-end dimensions;

— flange dimensions including bolt hole orientation, bolt hole diameters and flange facings;

— gate seat position and stem projection in accordance with 5.6.6.

Justification

This requirement promotes standardization of minimum requirements for visual inspections after assembly.

Add new Table F.1

Table F.1—NDE Requirements

Part	QSL1		QSL2 and QSL2G		QSL3 and QSL3G		QSL4	
	Cast	Forged	Cast	Forged	Cast	Forged	Cast	Forged
Body, bonnet, yoke, gland flange [e]	VT1	VT2	VT1	VT2	VT1	VT2	VT1	VT2
			MT2 [g] or PT1 [g]	MT1 [g] or PT1 [g]	MT2 [g] or PT1 [g]	MT1 [g] or PT1 [g]	MT2 or PT1	MT1 or PT1
			RT1 [a, g]	N/A	RT1 [a]	UT2	RT1 [a, d] and UT1	UT2
Welding ends (including pipe pup welding ends) [b]	VT1	VT2	VT1	VT2	VT1	VT2	VT1	VT2
			MT2 [g] or PT1 [g]	MT1 [g] or PT1 [g]	MT1 or PT1	MT1 or PT1	MT2 or PT1	MT1 or PT1
			RT3 [g] or UT4 [g]	UT2 [g]	RT3 or UT4	UT2	RT3 or UT4	UT2
Stem [c, e]	N/A	VT2	N/A	VT2	N/A	VT2	N/A	VT2
						MT1 or PT1		MT1 or PT1
						N/A		UT2
Pressure-containing bolting	N/A	VT4	N/A	VT4	N/A	VT4	N/A	VT4 and
								MT1 or PT1
Gate [c]	VT1	VT2	VT1	VT2	VT1	VT2	VT1	VT2
					MT2 [g] or PT1 [g]	MT1 [g] or PT1 [g]	MT2 or PT1	MT1 or PT1
Seat rings [c, e]	VT1	VT2	VT1	VT2	VT1	VT2	VT1	VT2
					MT2 [g] or PT1 [g]	MT1 [g] or PT1 [g]	MT2 or PT1	MT1 or PT1
Corrosion-resistant overlay	VT3 and PT1				VT3 and UT3 [f] and PT1		VT3 and UT3 and PT1	
Seals gaskets	VT4							
Pressure-containing welds	[h]		VT3		VT3			
			N/A		MT1 or PT1			
			RT2 or UT3		RT2 or UT3			
Fillet and attachment welds to pressure-containing parts	VT3				VT3			
					MT1 or PT1			
Hard facing	VT4				VT4 and PT1			
Sealing surfaces	VT4				VT4			
					MT3 or PT2			
Welded on lifting lugs	VT3							
	PT1 or MT1							
Integrally cast lifting lugs	RT3 or UT4							

Table F.1 *(continued)*

Part	QSL1		QSL2 and QSL2G		QSL3 and QSL3G		QSL4	
	Cast	Forged	Cast	Forged	Cast	Forged	Cast	Forged

Key

MT1, MT2, MT3, PT1, PT2, PT3, RT1, RT2, RT3, UT2, VT1, VT2, VT3, VT4: NDE codes. Refer to Table F.2.

N/A: The manufacturer is not allowed to use this material form for that specific part.

NOTE 1 The NDE codes used in this table are defined in Table F.2 which specifies the extent, method and acceptance criteria of examination for each NDE code.

NOTE 2 Qualification and NDE requirements for pilot casting shall be in accordance with IOGP S-563:2021, 4.8, except when API 20A is an acceptable alternative to MSS SP-147.

[a] RT1 may be replaced, by agreement, with UT4 for castings with minimum wall thickness greater than 175 mm .

[b] See ASME B16.34:2020, 8.3.1.1 (a) (1).

[c] MT or PT shall be performed prior to coating or overlay.

[d] RT1 plus UT1 may be replaced by RT3.

[e] Requirements for examination of bar material and of forgings shall be the same.

[f] Applicable to machined surfaces only.

[g] 5 % or a minimum of one part per component batch shall be examined for QSL2. 10 % or a minimum of one part per component batch shall be examined for QSL3. If defects outside the acceptance criteria are detected, at least two additional parts shall be tested, and if any of these fails, all items from the batch represented shall be examined.

[h] NDE requirements shall be in accordance with ASME B31.3 for normal fluid service.

Justification

This table promotes standardization of NDE requirements for QSLs.

Add new Table F.2

Table F.2—Extent, Method, and Acceptance Criteria of Nondestructive Examination (NDE) and Item Examination Code

Examination	Extent	Method	Acceptance
RT1	Areas defined by ASME B16.34 for special class valves, at abrupt changes in sections and at the junctions of risers, gates or feeders to the casting	ASME BPVC, Section V:2023, Article 2	ASME B16.34, Annex I up to QSL3 and QSL 3G, and ASME BPVC, Section VIII, Division 1:2023, Appendix 7 for QSL 4
RT2	100 %	ASME BPVC, Section V:2023, Article 2	ASME BPVC, Section VIII, Division 1:2023, UW-51 for linear indications and ASME BPVC, Section VIII, Division 1:2023, Appendix 4 for rounded indications
RT3	100 %	ASME BPVC, Section V:2023, Article 2	ASME BPVC, Section VIII, Division 1:2023, Appendix 7
UT1	Areas not covered by RT1	ASME BPVC, Section V:2023, Article 5	ASTM A609/A609M:2012, Table 2, Quality Level 2
UT2	All surfaces	ASME BPVC, Section V:2023, Article 5	Forgings: ASME BPVC, Section VIII, Division 1:2023, UF-55 for angle beam and ASME B16.34 for straight beam Plates: ASTM A578/A578M
UT3	Weldments: all surfaces	ASME BPVC, Section V:2023, Article 4	ASME BPVC, Section VIII, Division 1:2023, Appendix 12
	Overlay: all accessible machined surfaces	ASME BPVC, Section V:2023, Article 4 straight beam method	ASTM A578/A578M standard Level C
UT4	100 %	ASME BPVC, Section V:2023, Article 5	ASTM A609/A609M:2012, Table 2, Quality Level 1
MT1	All accessible surfaces	ASME BPVC, Section V:2023, Article 7	ASME BPVC, Section VIII, Division 1:2023, Appendix 6
MT2	All accessible surfaces	ASME BPVC, Section V:2023, Article 7	ASME BPVC, Section VIII, Division 1:2023, Appendix 7
MT3	All sealing surfaces	ASME BPVC, Section V:2023, Article 7	No rounded or linear indications in pressure-contact sealing surfaces are permitted Re-examination of questionable indications as per ASME BPVC, Section VIII, Division 1:2023, Appendix 6-3 (c) is acceptable
PT1	All accessible surfaces	ASME BPVC, Section V:2023, Article 6	ASME BPVC, Section VIII, Division 1:2023, Appendix 8
PT2	All accessible surfaces	ASME BPVC, Section V:2023, Article 6	ASME BPVC, Section VIII, Division 1:2023, Appendix 7

Table F.2 *(continued)*

Examination	Extent	Method	Acceptance
PT3	All sealing surfaces	ASME BPVC, Section V:2023, Article 6	No rounded or linear indications in pressure-contact sealing surfaces are permitted Re-examination of questionable indications as per ASME BPVC, Section VIII, Division 1:2023, Appendix 8-3 (c) is acceptable
VT1	100 % accessible as cast surfaces	7.1.2	7.1.2
VT2	100 % accessible as forged surfaces	Applicable MDS [b]	Applicable MDS [b]
VT3	Weldments: 100 % accessible as welded surfaces	ASME BPVC, Section V:2023, Article 9	No undercut reduction to the thickness of the area (considering both sides) to below the minimum thickness No surface porosity and exposed slag on or within 45 mm (1.77 in.) of sealing surfaces
	Overlay: applicable EDS [b]	Applicable EDS [b]	Applicable EDS [b]
VT4	100 % accessible surfaces	Manufacturer's requirements and applicable EDS [b]	Manufacturer's requirements and applicable EDS [b]

[a] For NDE requirements for pilot casting, refer to the applicable IOGP S-563 MDS or EDS as referenced in Annex D.

[b] Refer to the applicable IOGP S-563 MDS or EDS as referenced in Annex D. Where no MDS or EDS is referenced in Annex D, the applicable material standard applies without additional requirements.

Justification

This table defines the required extent, method and acceptance of NDE activities.

F.3 Pressure Testing

F.3.1

The requirements of Table F.3 shall replace those of API 598:2023, Table 1.

Justification

This requirement ensures the use of Table F.3 which is based upon QSLs for a more flexible approach to the required pressure testing based on criticality.

F.3.2

When the test pressure is limited by extension pup pieces, testing procedures and manufacturing sequences shall be revised accordingly.

Justification

This requirement ensures adequate testing procedures and manufacturing sequences for reduced test pressure.

F.3.3

Testing shall be carried out in accordance with Table F.3.

Justification

This requirement minimizes the risk of a safety incident due to a valve failing a gas test before it has been hydrotested. Fugitive emission testing is performed as after the other pressure tests as those may affect the fugitive emission testing results.

F.3.4

For QSL2 and higher, the requirements of Table F.4 shall replace those of API 598:2023, Table 4.

Justification

This requirement provides increased assurance for QSL2 and higher by increasing the durations for pressure testing.

F.3.5

Manually operated (i.e., with a handwheel or a gearbox) and actuated valves shall be seat tested after assembly of the operating mechanism.

Justification

This requirement ensures that the valve is tested in its fully constructed condition, preventing the risk of a valve tested without its operating mechanism and potential incorrect test results.

Add new Table F.3

Table F.3—Pressure Testing Requirements for Quality Specification Levels (QSLs)

Sequence	Test Description	Size	ASME Class	QSLs					
				QSL1	QSL2	QSL2G [a]	QSL3	QSL3G [a]	QSL4
1	High-pressure backseat (water) [b]	All	All	Required	Required	Required	Required	Required	Required
2	Shell (water)	All	All	Required	Required	Required	Required	Required	Required
3	High-pressure closure (water)	All	All	Required	Required	None	Required	None	Required
4	High-pressure gas closure test	All	All	None	None	Required	None	Required	Required
5	Low-pressure closure (air or inert gas)	All	All	Required	Required	Required	Required	Required	Required
6	High-pressure gas backseat test [b]	All	All	None	None	None	None	None	Required
7	High-pressure gas shell test	All	All	None	None	Required	None	Required	Required
8	Production fugitive emission testing as per 5.13.3	All	All	When specified	When specified	When specified	When specified	When specified	When specified
9 [c]	Functional and torque test	All	All	None	Required	Required	Required	Required	Required

[a] QSL2G and QSL3G are designations used for gas service.

[b] Gland packing bolts shall be retightened to the manufacturer's recommended values after the back seat test (refer to 5.9 and 9.4).

[c] Functional testing of the valve may be performed during pressure tests.

Justification

This table is based on QSLs for a more flexible approach to the required pressure testing based on criticality.

Add new Table F.4

Table F.4—Duration of Required Test Pressure for Quality Specification Level 2 (QSL2) and Higher

Valve Size DN (NPS)	Minimum Test Duration [a] minutes				
	Hydrostatic Shell	Gas Shell	Backseat	Hydrostatic Closure	High/Low Gas Closure
≤ 100 (≤ 4)	2	5	2	2	5
150 to 250 (6 to 10)	5	15	5	5	15
300 to 450 (12 to 18)	15	15	5	5	15
≥ 500 (≥ 20)	30	30	5	10	30

[a] The test duration is the period of inspection after the valve is fully prepared and under full pressure. Test durations start only once the test pressure has stabilized.

Justification

This table provides increased assurance for QSL2 and higher by increasing the durations for pressure testing.

F.3.6 Torque Measurements and Functional Testing

F.3.6.1 General

F.3.6.1.1

For functional testing, valve seats shall be free of sealant.

Justification

This requirement ensures that the test is truly representative of the installed condition of the valve. This also aligns with API 598.

F.3.6.1.2

Lubricant required for assembly shall not exceed the viscosity range of SAE 10W motor oil.

Justification

This requirement promotes standardization of the viscosity range of the lubricant used which can affect leak testing.

F.3.6.2 Functional and Torque Testing

F.3.6.2.1

Valves ordered with a manual operator (i.e., handwheel or gearbox) or an actuator shall be tested with the final operator fitted on.

Justification

This requirement ensures that the test is truly representative of the installed and in-use condition of the valve.

F.3.6.2.2

The torque shall be measured directly on the input shaft of the gear or, for direct-mounted handwheels, on the stem.

Justification

This requirement ensures that torque values are taken from points where the maximum torque can be applied to give accurate results on the test report. If incorrect torques are recorded, the valve can be at risk of failure from over torquing.

F.3.6.2.3

Gearbox output torques shall be calculated using the gearbox mechanical advantage ratio.

Justification

This requirement promotes standardization of the correct calculation method for output torques.

F.3.6.2.4

Torque measurements shall be carried out at the break-to-open, break-to-close and end-to-close positions.

Justification

This requirement ensures that measurements are recorded at the three points in the valve cycle where the highest torques are encountered. If this is not done at these points, incorrect torque values can be measured, leading to valve failure by overtorquing.

F.3.6.2.5

The rim pull force required to seat and unseat the valve shall be calculated.

Justification

This requirement promotes standardization of the maximum allowed rim pull force and aligns with 5.11.1.

F.3.6.2.6

Acceptance for functional and torque testing of the valve shall include the following requirements.

a) The valve shall demonstrate smooth operability.

b) The calculated rim pull shall not exceed the value listed in 5.11.1.

c) The measured torque results shall not exceed the manufacturer’s documented valve torques.

Justification

This requirement ensures ease of use when installed and standardization of the rim pull force, aligning with API 6D, and prevents the risk of overstressing.

F.3.6.3

The hydrostatic test fluid shall be fresh water containing a corrosion inhibitor.

Justification

This requirement ensures the prevention of remaining traces of hydrotest water which can cause rust to the valve, resulting in potential leakages.

F.3.6.4

Valves shall be completely drained of test fluid and dried immediately after hydrotesting.

Justification

This requirement ensures that valves are dry and not susceptible to corrosion from remaining test fluids, which can cause leakages.

F.3.6.5

Valves with a pressure seal body-to-bonnet joint shall be subjected to low-pressure gas shell test at 90 psi ± 15 psi (6 bar ± 1 bar) for 5 minutes.

Justification

This requirement ensures that the stress on the valve structure during testing is minimized.

F.3.6.6

The low-pressure gas shell test leakage criteria for valves with a pressure seal body-to-bonnet joint shall be in accordance with API 598:2023, 5.9.1.1.

Justification

This requirement ensures that the test leakage criteria are specified.

Add new Annex G

Annex G
(informative)

Specified Customization—Supplementary Options to Specified Design and Manufacturing Requirements

G.1

The supplementary requirements of this annex apply only when specified in the purchase order or purchasing documentation.

Justification

This requirement ensures that each requirement in this annex is defined as optional and not normative.

G.2

When specified, handwheels shall be constructed of solid (non-hollow) materials.

Justification

This requirement ensures that handwheels do not fail due to excessive corrosion when used in extremely corrosive environments.

G.3

When specified, valves shall be fire type-tested in accordance with ISO 10497 or API 6FA.

Justification

This requirement ensures that the valve is suitable for fire safe conditions when required, preventing the risk of unexpected leakage due to fire.

G.4

When specified, the nameplate shall contain metric and US customary units.

Justification

This requirement prevents the risk of a wrong conversion by the user from one unit system to the other.

G.5

When specified, valves shall be marked in accordance with Table G.1.

Justification

This requirement ensures that marking preferences extending beyond API 600 are included when the purchaser deems it necessary.

G.6 Chainwheels

G.6.1

When specified, chainwheels shall be of direct-mounted adjustable sprocket rim type with chain guides.

Justification

This requirement ensures that clamp-on type chainwheels are not used as they can detach and cause injury to the operator.

G.6.2

When specified, chainwheels shall not be of the clamp-on type.

Justification

This requirement ensures that clamp-on type chainwheels are not used as they can detach and cause injury to the operator.

G.6.3

When specified, chainwheels shall be securely attached and provided with safety cables.

Justification

This requirement ensures that clamp-on type chainwheels are not used as they can detach and cause injury to the operator.

G.6.4

When specified, chainwheels for valves above DN 150 (NPS 6) without the gearbox shall incorporate a hammer-blow device.

Justification

This requirement ensures that clamp-on type chainwheels are not used as they can detach and cause injury to the operator.

G.7

When specified, lifting points shall be in accordance with API 17D:2021, Annex G and ISO 13628-4:2010, Annex K.

Justification

This requirement ensures standardization of the calculation method for lifting points if the purchaser requires this option.

Add new Table G.1

Table G.1—Valve Marking

Item Number	Marking [a, b]	Location
1a	Manufacturer's name	On body and/or nameplate
1b	Trademark or mark (optional)	On body and/or nameplate
2a	Pressure class (except when row 2b applies)	On body and nameplate
2b	Intermediate pressure rating (agreed upon rated class)	On body and nameplate
3	Pressure-temperature rating — Maximum operating pressure at maximum operating temperature — Maximum operating pressure at minimum operating temperature	On nameplate
4	Face-to-face/end-to-end dimensions, if not as per ASME B16.10	On nameplate
5a	Body/end connector/bonnet/cover material designation and material grade	On body/ end connector/bonnet/cover and nameplate
5b	Body/end connector/bonnet/cover melt identification (e.g., case or heat number)	On body/end connector/bonnet/cover
6a	Body/bonnet material designation and material grade	On body/bonnet
6b	Body/bonnet melt identification (e.g., heat number)	On body/bonnet
7	Trim identification material grade symbols indicating material of stem and sealing faces of closure members if different from that of body	On nameplate
8	Nominal valve size	On body and nameplate
9	Ring joint groove number	On valve flange OD
10	SMYS (units) of valve ends, where applicable	On body weld ends
11	QSL1, QSL2, QSL2G, QSL3, QSL3G or QSL4	On nameplate
12	Unique serial number	On body and nameplate
13	Date of manufacture (month and year)	On nameplate
14	API 600	On nameplate
15	ASME B16.34	On nameplate
16	Product specification license number (if applicable)	On nameplate
17	Schedule on weld end valves	On weld ends or nameplate
18	Valve data sheet identification code	On nameplate

NOTE MSS SP-25 gives guidance on marking.

[a] Where the grade and class does not uniquely identify the material specification, the material specification, grade and class shall be marked (e.g., A516-70).

[b] When the body is manufactured from more than one type of material, body and end connector materials shall be identified.

Justification

This table ensures that marking preferences extending beyond API 600 are included when the purchaser deems it necessary.

G.8

When specified, a sample of austenitic stainless-steel gaskets (spiral wound or ring joint) shall pass an intergranular corrosion test in accordance with ASTM A262:2021, Practice E.

Justification

This requirement ensures the integrity of the gasket and its ability to seal in severely corrosive applications, preventing potential leakages.

G.9

When specified, the following documents shall be retained by the manufacturer for a minimum of ten years from the start of the contract guarantee period:

a) design calculations;

b) cross-section drawings with parts and materials list, with the minimum and maximum design temperatures shown on the valve drawings;

c) manufacturing, testing and inspection procedures;

d) welding procedures and qualification records;

e) nondestructive testing procedures and qualifications;

f) material qualification records in accordance with IOGP S-563;

g) manufacturing, testing and inspection equipment calibration records;

h) nonconformance records;

i) list of applicable and authorized concessions, waivers and/or material substitutions;

j) list of applicable manuals (e.g., assembly or maintenance manuals);

k) material test reports and inspection certificates, traceable by heat number to the foundry or mill, including for sour service materials a statement confirming compliance with ANSI/NACE MR0175/ISO 15156 or ANSI/NACE MR0103/ISO 17945;

l) weld maps of major repairs;

m) heat treatment records, including heat treatment charts;

n) relevant fabrication drawings and sketches to facilitate the understanding of welding, heat treatment and NDE records;

o) visual inspection records;

p) chloride content;

q) pressure test results.

Justification

This requirement ensures that the listed documents can be requested from the manufacturer for a set period of ten years. In the event that the purchaser no longer has access to the original documents sent at the time of purchase, this requirement ensures that the documents can still be accessed.

G.10

When specified, NDE reports, including sketches if applicable, that show the locations of examination traceable by heat or serial number shall be retained by the manufacturer for at least five years from the start of the contract guarantee period.

Justification

This requirement ensures that the listed documents can be requested from the manufacturer for a set period of five years. In the event that the purchaser no longer has access to the original documents sent at the time of purchase, this requirement ensures that the documents can still be accessed.

G.11

When specified, radiographs shall be retained by the manufacturer for a minimum of one year from the start of the contract guarantee period.

Justification

This requirement ensures that the listed documents can be requested from the manufacturer for a set period of one year. In the event that the purchaser no longer has access to the original documents sent at the time of purchase, this requirement ensures that the documents can still be accessed.

G.12

When specified, stainless steel bellows shall be hydrostatically tested with demineralized water that has a chloride content less than or equal to 2 ppm.

Justification

This requirement ensures the integrity of bellows in case of any left-over water post hydrotesting which leads to higher concentration of chloride and can cause damage.

G.13

When specified, carbon steel yokes shall not be used for service temperatures below -20 °C (-4 °F) or above 400 °C (752 °F).

Justification

This requirement prevents the risk of a failed yoke due to the use of regular carbon steel which can still potentially see process temperatures for which it is not suitable.

G.14

When specified, gearboxes shall be designed with rolling element thrust bearings.

Justification

This requirement prevents the use of non-rolling bearings, which can cause failure of the gearbox.

G.15

When specified, packing boxes shall be manufactured from a corrosion-resistant material or overlaid with CRA material.

Justification

This requirement prevents corrosion where the stem and stem packing are in contact with the bonnet.

G.16

When specified, the IEC 60529 IP code for gearboxes shall be IP66.

Justification

This requirement ensures an IEC 60529 IP66 protection class which requires having full protection against dust, particles similar to dust and high-pressure water jets.

G.17

When specified, the IEC 60529 IP code for gearboxes shall be IP67.

Justification

This requirement ensures an IEC 60529 IP67 protection class which requires having full protection against dust, particles similar to dust and water submersion.

G.18

When specified, the number of packing rings in the packing box shall be a maximum of six.

Justification

This requirement ensures the prevention of uneven loading of packing rings during packing compression, resulting in potential leakages.

G.19

When alloy 625 material is specified for sour service, hardness shall not exceed 35 HRC.

Justification

This requirement ensures the prevention of material failure due to high hardness of alloy 625 combined with sour service.

G.20

When specified, mechanical retention of the stem nut to the yoke shall be by permanent tack weld.

Justification

This requirement ensures the prevention of detachment of the stem nut to the yoke which can result in potential leakages.

G.21

When specified, valves shall be in accordance with the PED 2014/68/EU.

Justification

This requirement ensures that valves installed in Europe are in accordance with the PED 2014/68/EU.

G.22 Impact testing

G.22.1

When the PED 2014/68/EU is specified, the body and bonnet material component batch shall be impact tested.

Justification

This requirement ensures standardization of impact testing.

G.22.2

Impact testing shall be performed in accordance with ASTM A961/A961M or ASTM A703/A703M S8 as applicable at a temperature of -29 °C (-20 °F) or lower if mandated by the material grade.

Justification

This requirement ensures standardization of impact testing.

G.22.3

Acceptance criteria for impact testing shall be 27 J (20 ft·lbf) average, 20 J (15 ft·lbf) single.

Justification

This requirement ensures standardization of impact testing.

G.22.4

For impact testing, the thickness of the test block shall be equal to the thickest part of the casting/forging component.

Justification

This requirement ensures standardization of impact testing.

G.22.5

For impact testing of flanged components, the largest flange thickness shall be the ruling section.

Justification

This requirement ensures standardization of impact testing.

G.22.6

For impact testing of flanged components, test specimens shall be taken in the center section with thickness/4 on each side.

Justification

This requirement ensures standardization of impact testing.

G.22.7

When specified, impact testing shall be carried out on austenitic stainless steel.

Justification

This requirement ensures standardization of impact testing.

G.23

When marine or offshore service is specified, valve bolting material shall be UNS N07718 in accordance with API 6ACRA.

Justification

This requirement prevents corrosion of bolting which can lead to valve failure.

G.24

When specified, galvanized bolting and components shall not be used.

Justification

This requirement prevents the risk of catastrophic failure due to the liquid metal embrittlement of stainless steel which zinc can cause when exposed to fire.

G.25 Stem Protector

G.25.1

When specified, valves shall be equipped with a fully enclosed weatherproof stem protector.

Justification

This requirement ensures that the valve operates effectively when installed in locations subject to severe weather.

G.25.2

With the valve in the fully open position, the stem protector design shall provide a minimum clearance of 25 mm (1 in.) between the top of the stem and the inside top of the stem protector.

Justification

This requirement ensures the prevention of damage or dislocation of the stem protector.

G.25.3

If the stem protector obscures the position of the stem, the design shall be provided with a position indicator.

Justification

This requirement ensures that the position of the valves is known, preventing safety incidents caused when the valve is operated under the incorrect process isolation conditions.

G.25.4

When specified, the stem protector shall have a stem nut grease injector.

Justification

This requirement ensures the lubrication and protection via grease application to the stem, preventing the risk of the valve becoming inoperable due to jamming.

G.26

When specified, valves shall be equipped with a non-pressure-containing stem extension in accordance with API 6D.

Justification

This requirement ensures that the valve can still be accessed and operated when installed in an inaccessible location (e.g., operating from a platform). API 6D provides accepted industry standard requirements to ensure safe robust design.

G.27 Lagging Extensions

G.27.1

When specified, valves shall include a lagging bonnet extension as specified in Table G.2.

Justification

This requirement ensures that insulation can be accommodated when specified.

G.27.2

Lagging extension lengths shall be measured from the top of the end flange rim or body diameter, whichever is larger, to the upper bonnet flange.

Justification

This requirement promotes standardization of how lagging extension lengths are to be measured.

Add new Table G.2

Table G.2—Lagging Extension Lengths Clearance Required for Insulation

DN (NPS) Minimum	DN (NPS) Maximum	Lagging Extension Length mm (in.)
15 (½)	50 (2)	80 (3.0)
80 (3)	400 (16)	110 (4.5)
450 (18)	1200 (48)	120 (5.0)

Justification

This table promotes standardization of lagging extension lengths.

G.27.3

The lagging extended bonnet shall be provided with an insulation collar plate.

Justification

This requirement ensures that there is a physical barrier on the bonnet for insulation, improving the ability to install insulation correctly.

G.28

When an adjustable collar plate is specified, the bolting shall be on the upper side.

Justification

This requirement ensures easy adjustment of the collar plate for ease of insulation installation.

G.29

When specified, manually operated isolation valves shall be supplied with brackets, locking plates or other devices to allow the valve to be locked in the open or closed position.

Justification

This requirement ensures that the valve can be locked in the open or closed position.

G.30

When specified, acceptance criteria for Charpy V-notch impact toughness testing of 20 Cr Group B, 22 Cr, 25 Cr and 27 Cr materials shall be in accordance with ISO 17781:2017, Table 2, QL I.

Justification

This requirement ensures that acceptance criteria are defined.

G.31

When specified, for valve sizes above NPS 2 (DN 50) with a cast pressure-containing part, the hydrostatic shell test procedure shall consist of the following steps:

a) primary pressure-holding period;

b) reduction of the pressure to zero;

c) secondary pressure-holding period.

Justification

This requirement ensures that test document content is standardized and defined.

G.32

When localized CRA weld is specified at the seats and seals areas, it shall extend beyond the contact area by a distance of at least 3 mm ($^1/_8$ in) on both sides.

Justification

This requirement ensures longevity and continued operability of the valve, preventing the risk of reduced life time of the valve.

Add new Annex H

Annex H
(normative)

Valves Outside of API 600 Size Limit

H.1

This annex applies to valve sizes above those listed in Table 1 and that meet the requirements of API 600, ASME B16.34 and this specification.

Justification

This statement details the scope of the annex.

H.2

Design and calculations shall be in accordance with ASME B31.3:2022, 304.7.2, b, c or d requirements for unlisted components.

Justification

This requirement promotes standardization of calculations and design for valves outside API 600 scope.

H.3

Wall thickness shall not be less than the thickness required for ASME B16.34 standard class including any corrosion allowance specified.

Justification

This requirement promotes standardization of wall thicknesses for valves outside API 600 to the recognized industry standard of ASME B16.34. This prevents the risk of valves with thinner wall thickness than required for the pressure class, resulting in a potential safety risk.

H.4

Valves shall be subjected to design validation testing in accordance with API 6D:2021, Annex F or the purchaser's specified validation test.

Justification

This requirement prevents the risk that API 600 design validation is used, which can lead to valve failure as the exempt experience for API 600 does not apply to valves in these sizes.

Add new Annex I

Annex I
(informative)

Fugitive Emission Type Testing in Accordance with ISO 15848-1

I.1 General

I.1.1

This annex specifies modifications to ISO 15848-1.

NOTE Validation tests that have been completed in accordance with IOGP S-611:2019, Annex J during their validity meet the requirements of this annex.

Justification

This guidance text is the scope of this annex.

I.1.2

When specified, fugitive emission type testing shall be performed in accordance with ISO 15848-1 and this annex.

Justification

This ensures fugitive emission testing is performed to ISO 15848-1 as well as this annex.

I.1.3

When there is a conflict between the requirements of ISO 15848-1 and this annex, the requirements of this annex shall govern.

Justification

This requirement clarifies the order of precedence between this annex and ISO 15848-1.

I.2 Test Conditions

I.2.1 Test Fluid

I.2.1.1

The use of methane as a test fluid shall not be allowed.

Justification

This requirement ensures that safety issues including risk of fire from using methane are prevented.

I.2.1.2

The test fluid shall be helium gas of 97 % minimum purity, or a mixture of 10 % helium and 90 % nitrogen.

Justification

This ensures that for larger sizes, a helium and nitrogen mixture may be used to save on the cost of using helium gas of 97 % purity.

I.2.1.3

The use of a mixture of 10 % helium and 90 % nitrogen shall not be allowed for valve sizes below DN 300 (NPS 12).

Justification

This requirement ensures that pure helium is used for more accurate test results as the cost saving of using helium and nitrogen mixture is negligible for valves of smaller sizes.

I.2.1.4

When testing with a mixture of 10 % helium and 90 % nitrogen, the measured detector reading shall be multiplied with a factor 10.

Justification

This requirement ensures that readings are aligned with the pure helium test method.

I.2.2 Test Temperature

The test temperatures selected to qualify valve designs shall be the minimum and maximum design temperatures.

NOTE The manufacturer may use a wider temperature range during the qualification test provided that this range covers the minimum and maximum specified design temperature range.

Justification

This ensures that the test covers the full temperature range of the valve.

I.3 Stem/Shaft Leakage Measurement

I.3.1

Stem leakage measurement shall be performed using one of the following methods:

a) vacuum method in accordance with ISO 15848-1:2015, A.1;

b) bagging accumulation method in accordance with ISO 15848-1:2015, A.2 and EN 13185:2001,10.4;

c) local leakage measurement (sniffing) in accordance with ISO 15848-1:2015, B.1.

Justification

This requirement ensures that stem leakage measurements are conducted using standardized methods, mitigating the risk of inaccurate leakage assessments that can lead to incorrect test results and potential valve fugitive emissions.

I.3.2

Stem leakage measurement shall be expressed in mg/s, atm·cm^3/s, Pa·m^3/s or mbar·l/s.

Justification

This requirement ensures that stem leakage measurements are standardized, mitigating the risk of misinterpretation and inconsistency in data reporting that can lead to ineffective fugitive emission testing.

I.4 Test Procedures

I.4.1 Test Equipment

I.4.1.1

Test equipment shall have a valid calibration certificate.

Justification

This requirement ensures that the equipment is fit for purpose.

I.4.1.2

The equipment calibration certificate shall be valid for at least six months after the test completion.

Justification

This requirement ensures that the test equipment is fit for purpose.

I.4.1.3

The valve gland and body and bonnet joints shall be sealed with adhesive aluminium foil tape.

Justification

This requirement creates a contained volume for accurate test results.

I.4.1.4

The tape shall have a hole at the highest point.

Justification

This requirement ensures that an inserted sniffer probe picks up any leakage.

I.4.1.5

The tape shall have a tube at the bottom with the same diameter as that of the sniffer probe and a length of at least 20 times that of the tube diameter.

Justification

This requirement ensures the drainage of any liquid out to prevent pressure in the bag from dropping below atmospheric pressure and to prevent leaked helium from escaping into the atmosphere.

I.4.1.6

Body and bonnet static seal fugitive emission testing shall conform to the accumulation technique in accordance with the accumulation (bagging) method of ISO 15848-1:2015/Amd.1:2017, A.2 .

Justification

This requirement ensures that body and bonnet static seal fugitive emission testing adheres to the accumulation technique specified in ISO 15848-1:2015, A.2, mitigating the risk of undetected emissions and potential valve leakage when in service.

I.4.1.7

Personnel performing emission testing shall be qualified in accordance with the manufacturer's documented training program which is based on the Level 1 requirements specified in ISO 9712 or ASNT SNT-TC-1A for the tracer gas method.

Justification

This requirement ensures that personnel performing emission testing are qualified, mitigating the risk of inaccurate results.

I.4.1.8

Fugitive emissions shall be measured with a mass spectrometer.

Justification

This requirement ensures standardization of the instrument for measurement, mitigating the risk of undetected emissions and potential valve leakage when in service.

I.4.1.9

The test shall be considered failed if the mass spectrometer reading exceeds the leakage rate for the applicable tightness class as specified in ISO 15848-1:2015, Table 1.

NOTE The minimum detectable leak rate for direct sniffing in accordance with EN 1179, technique B4 is 1 x 10-7 Pa·m^3/s (1 x 10-6 mbar·l/s).

Justification

This requirement ensures that allowable leakage rates are aligned with ISO 15848-1, mitigating the risk of unacceptable levels of fugitive valve emissions when in service.

I.4.2 Test Description

I.4.2.1

The valve mounting shall be with the stem or shaft in the horizontal position, unless otherwise agreed.

Justification

This requirement ensures that testing is performed in the most onerous orientation.

I.4.2.2

Leakage measurement shall cover potential leak paths including the drain, vent, body joint and bolting connections.

Justification

This requirement ensures that all leakage paths are measured, preventing the risk of missing a leakage path and of potential valve leaks when in service.

I.5 Performance Classes

I.5.1

Mechanical cycles for isolation valves CO1 shall be carried out at one upper (maximum design) and one lower (minimum design) selected test temperature thermal cycle.

Justification

This requirement mitigates the risk of valve failure under varying design temperatures, ensuring operational reliability.

I.5.2

The sequence of testing and the minimum number of mechanical cycles for isolating valves, endurance class CO1 shall be 205 mechanical cycles, full stroke with one upper (maximum design) thermal cycle and one lower (minimum design) thermal cycle as follows:

— 50 cycles at RT;

— 50 cycles at upper selected test temperature;

— 50 cycles at RT;

— 50 cycles at lower selected test temperature;

— 5 cycles at RT.

Justification

This requirement mitigates the risk of valve failure under varying design temperatures, ensuring operational reliability.

I.6 Marking

Production valves qualified by type testing in accordance with this annex shall be marked with the following information:

a) “IOGP FE”;

b) tightness class;

c) endurance cycle;

d) stem seal adjustment number;

e) temperature range;

f) pressure class;

g) S-611.

EXAMPLE IOGP FE BH — CO1 — SSA 1 — (−46 °C, 150 °C) — CL150 — S-611

Justification

This requirement ensures standardization of marking, thereby mitigating the risk of improper use or misclassification that can lead to safety and compliance issues.

Add new Annex J

Annex J
(informative)

Fugitive Emission Production Testing in Accordance with ISO 15848-2

J.1 Introduction

J.1.1

This annex specifies modifications to ISO 15848-2.

Justification

This guidance text is the scope of this annex.

J.1.2

When specified, valves shall be subjected to fugitive emission production testing in accordance with ISO 15848-2 and this annex.

Justification

This ensures fugitive emission testing is performed to the industry recognized ISO 15848-2 as well as this annex.

J.1.3

When there is a conflict between the requirements of ISO 15848-2 and this annex, the requirements of this annex shall govern.

Justification

This requirement clarifies the order of precedence between this annex and ISO 15848-2.

J.2 Valve Selection

J.2.1 Lot Definition

The valves that constitute the lot from which the samples are drawn for testing shall have the following characteristics:

a) be part of the same purchase order;

b) have the same fugitive emission class;

c) be of the same type and design;

d) have the same stem diameter.

Justification

This requirement ensures standardization of the definition of the term "lot" to mitigate the risk of inconsistent test results.

J.2.2 Sample Size

J.2.2.1

The number of samples (n) to be drawn from each lot shall be determined by the fugitive emission class and the purchase order quantity per fugitive emission class (X) as specified in Table J.1.

Justification

This requirement ensures standardization of the sampling process and mitigating the risk of inadequate testing that can lead to undetected quality issues.

J.2.2.2

The sample strategy, including how many failed production tests per lot are acceptable, shall be determined in accordance with Table J.1.

Justification

This requirement ensures standardization of the sampling process and mitigating the risk of inadequate testing that can lead to undetected quality issues.

J.2.3 Sample Selection

J.2.3.1

The samples shall be selected at random from each lot.

Justification

This requirement ensures that the samples are selected at random from each lot, promoting unbiased testing and mitigating the risk of systematic errors that can affect the validity of inspection results.

J.2.3.2

When the lot consists of various sizes and pressure classes, sampling shall be applied in such a way that it covers the entire production range from that lot.

Justification

This requirement mitigates the risk of overlooking the variability of valves within the lot.

Add new Table J.1

Table J.1—Sample Strategy for Production Testing

Purchase Order Size (X) per Fugitive Emission Class	Sample Size (n) [a] Class AH	Sample Size (n) [a] Class BH	Acceptance Number (Ac)
X ≤ 10	Minimum 1 or as specified by purchaser	Minimum 1 or as specified by purchaser	0
11 ≤ X ≤ 100	5 %	3 %	0
101 ≤ X ≤ 1000	4 %	3 %	0
X > 1000	3 %	2 %	0

[a] The actual sample size shall be rounded up to the next whole number, with a maximum total sample size of 10 % of the whole purchase order (rounded up to the next whole number).

Justification

This requirement ensures standardization of the sampling process and mitigates the risk of inadequate testing that can lead to undetected quality issues.

J.2.4 Lot Acceptance

J.2.4.1

The lot shall be accepted when each tested valve meets the acceptance criteria in accordance with J.4.8.

Justification

This requirement mitigates the risk of defective valves entering service.

J.2.4.2

Valves that fail the test shall be repaired and retested.

Justification

This requirement ensures that any valve that fails the test is repaired and retested, thereby maintaining product integrity and mitigating the risk of operational failures or safety issues in service.

J.2.4.3

If a valve fails a test, additional valves shall be drawn from the failed lot in accordance with Table J.1.

Justification

This requirement ensures that additional valves are drawn from the failed lot for further testing, thereby providing a thorough assessment and mitigating the risk of undetected issues that can compromise safety and performance.

J.2.4.4

Upon subsequent rejection, the failed valve shall be repaired and retested.

Justification

This requirement ensures that any valve that fails the test is repaired and retested, thereby maintaining product integrity and mitigating the risk of operational failures or safety issues in service.

J.2.4.5

Upon subsequent rejection, the retest shall contain all valves from the lot.

Justification

This requirement ensures that all valves are drawn from the failed lot for further testing, thereby providing a thorough assessment and mitigating the risk of undetected issues that can compromise safety and performance.

J.3 Test Conditions

J.3.1 Test Fluid

J.3.1.1

The test fluid shall be helium gas of 97 % minimum purity, or a mixture of 10 % helium and 90 % nitrogen.

Justification

This requirement ensures a cost saving for larger sized valves where 100 % helium would be excessive.

J.3.1.2

The use of a mixture of 10 % helium and 90 % nitrogen shall not be allowed for valve sizes below DN 300 (NPS 12).

Justification

This requirement ensures a cost saving for larger sized valves only where 100 % helium would be excessive.

J.3.1.3

When testing with a mixture of 10 % helium and 90 % nitrogen, the measured detector reading shall be multiplied by a factor 10.

Justification

This requirement ensures that final readings are compatible with the acceptance criteria of valve testing with 100 % helium.

J.3.1.4

97 % helium test gases shall be certified as containing a minimum of 97 % pure helium.

Justification

This requirement prevents the risk of inaccurate results due to impure test gases which can affect emissions measurements.

J.3.2 Leakage Management

J.3.2.1

Leakages shall be measured by the sniffing method in accordance with ISO 15848-1:2015, B.1.

Justification

This requirement ensures the standardizing of the sniffing method and mitigating the risk of inadequate testing that can lead to undetected quality issues.

J.3.2.2

Leakages shall be expressed in mg/s, atm·cm^3/s, Pa·m^3/s or mbar·l/s.

Justification

This requirement ensures that stem leakage measurements are standardized, mitigating the risk of misinterpretation and inconsistency in data reporting that can lead to ineffective fugitive emission testing.

J.3.3 Test Pressure

The test pressure shall be the rated pressure at ambient temperature.

Justification

This requirement ensures that the test pressure is set to the rated pressure at ambient temperature, thereby standardizing testing conditions and mitigating the risk of inaccurate assessments that can result in operational failures or safety concerns.

J.3.4 Mechanical Adjustments

J.3.4.1

A maximum of one mechanical adjustment of the valve gland bolting of the packing box or stem seals shall be undertaken.

Justification

This requirement ensures that only one mechanical adjustment of the valve gland bolting of the packing box or stem seals is undertaken, thereby promoting consistency in performance and mitigating the risk of over-adjustment which can compromise seal integrity and valve functionality.

J.3.4.2

The test report shall show the location and timing of the mechanical adjustments.

Justification

This requirement ensures that only one mechanical adjustment of the valve gland bolting of the packing box or stem seals is undertaken, thereby promoting consistency in performance and mitigating the risk of over-adjustment which can compromise seal integrity and valve functionality.

J.3.5 Test Equipment

J.3.5.1

Fugitive emissions shall be measured with a mass spectrometer.

Justification

This requirement ensures standardization of the instrument for measurement and mitigates the risk of undetected emissions and potential valve leakage when in service.

J.3.5.2

Mass spectrometers and helium leak detectors shall have a sensitivity of at least 1.0 x 10-10 Pa·m^3/s, 1.0 x 109 mbar·l/s or 1.0 x 10-9 atm·cm^3/s as specified in ASME BPVC, Section V:2023, Appendix IV, 1061.2.

Justification

This requirement ensures standardization of detection capabilities and mitigates the risk of undetected leaks that can lead to operational failures.

J.3.5.3

Prior to commencing the test, the attached piping and tubing shall be checked for leaks.

Justification

This requirement ensures the mitigation of the risk of undetected leaks that can affect test accuracy and operational safety.

J.3.5.4

Production valves shall be mounted with the stem and the bore in the specified installation orientation.

Justification

This requirement ensures that testing is performed in the most onerous orientation.

J.3.5.5

When the installation orientation is not specified, production valves shall be mounted with the stem and the bore in the horizontal orientation.

Justification

This requirement provides directions when the orientation is not specified.

J.3.5.6

Test equipment shall have a valid calibration certificate.

Justification

This requirement ensures that test equipment has a valid calibration certificate, thereby mitigating the risk of inaccurate measurements that can lead to unreliable results and regulatory non-compliance.

J.3.5.7

The equipment calibration certificate shall be valid for at least six months after the test completion.

Justification

This requirement ensures that test equipment has a valid calibration certificate, thereby mitigating the risk of inaccurate measurements that can lead to unreliable results and regulatory non-compliance.

J.3.5.8

The valve gland, body and bonnet joints shall be sealed with adhesive aluminum foil tape.

Justification

This requirement creates a contained volume for accurate test results.

J.3.5.9

The tape shall have a hole at the highest point.

Justification

This requirement ensures that an inserted sniffer probe picks up any leakage.

J.3.6 Personnel

Personnel performing emission testing shall be qualified in accordance with the manufacturer's documented training program which is based on the Level 1 requirements specified in ISO 9712 or ASNT SNT-TC-1A for the tracer gas method.

Justification

This requirement ensures that personnel performing emission testing are qualified, mitigating the risk of inaccurate results.

J.4 Measurement of Stem/Shaft Seal Leakages

J.4.1

The test valve shall be half open and pressurized to the test pressure.

Justification

This requirement ensures that the test valve is half open and pressurized to the test pressure, thereby facilitating accurate testing conditions and mitigating the risk of inaccurate results due to improper valve positioning.

J.4.2

The stem seal leakage shall be measured using the sniffing method in accordance with ISO 15848-1:2015, B.1.

Justification

This requirement ensures standardization of the measurement approach and mitigates the risk of inaccurate leakage assessments that can lead to compliance issues and operational failures.

J.4.3

The measurements shall commence after the test pressure has been stabilized for the following durations:

— 15 minutes for valves with fugitive emission Class AH;

— 10 minutes for valves with fugitive emission Class BH.

Justification

This requirement promotes accurate readings and mitigates the risk of fluctuations that can affect the validity of the test results.

J.4.4

Wherever practical, the measurement of stem leakage (including for valves with operator brackets, stem tapings, etc.) shall be in accordance with J.4.3.

Justification

This requirement promotes consistency in measurement and mitigates the risk of discrepancies that can affect the reliability of leakage assessments.

J.4.5

Where J.4.4 is not practical on smaller manually operated valves, the stem seal shall be sniffed locally by means of a detector probe in accordance with ISO 15848-1:2015, B.1.

Justification

This requirement ensures a standardized alternative method for smaller valves, thereby ensuring accurate leakage detection and mitigating the risk of undetected emissions.

J.4.6

The tests shall be carried out in a still (draft free) environment.

Justification

This requirement promotes accurate measurements and mitigates the risk of interference from airflow that can affect test results.

J.4.7

The stem leakage shall be measured during the final mechanical cycle, when the closure member moves from the fully closed to the fully open position with the same sniffing technique.

Justification

This requirement maintains consistency in measurement and mitigates the risk of overlooking potential leaks during operation.

J.4.8

The test shall be considered failed if the mass spectrometer reading exceeds the leakage rate for the applicable fugitive emission class as specified in Table J.2.

Justification

This requirement standardizes the acceptable leakage rate.

J.4.9

The minimum detectable leak rate for direct sniffing (refer to EN 1179, Technique B4) shall be 1 x 10-7 Pa·m^3/s (1 x 10^{-6} mbar·l/s).

Justification

This requirement standardizes the detection capabilities and mitigates the risk of undetected leaks that can impact safety and compliance.

J.4.10

If the test valve requires more than one mechanical adjustment, the test shall be considered as failed.

Justification

This requirement promotes consistency in performance and mitigates the risk of compromised valve integrity due to over-adjustment.

J.5 Certification of Compliance

Certification requirements shall be in accordance with this specification.

Justification

This requirement standardizes the certification process and mitigates the risk of non-compliance or variations that can affect product quality and safety.

J.6 Sampling Plan Example (informative)

The sampling strategy for an example purchase order for gate valves is given in Table J.4.

— The purchase order quantity (X) per fugitive emission class is 1055 gate valves with fugitive emission class BH.

— As these valves are suitable for fugitive emission class BH, 2 % of each lot (rounded-up to the next whole number) are to be tested as per Table J.1.

— The maximum number of valves to be tested is 10 % per purchase order (rounded-up to the next whole number), i.e., 106 valves for the complete purchase.

— The valves are selected at random from each lot in accordance with Table J.3 and tested in accordance ISO 15848-2 and this annex.

If there is a failure in any of the tests (e.g., any test valve representing the second lot containing 437 valves), this lot is rejected, and the failed valve is repaired and retested.

— In addition, other valves are drawn at random from the lot and tested in accordance with Table J.1 (9 valves).

— Upon a subsequent rejection, the lot is rejected and the failed valves are repaired and retested.

— In addition, all valves from that lot are retested (and repaired) until all valves have passed the tests.

Justification

This provides an example of a sampling plan.

Add new Table J.2

Table J.2—Tightness Classes for Stem Seals

Fugitive Emission Tightness Class	Measured Leak Rate		Stem Seal Leak Rate	
	[mg/(s·m_{circ})]	[atm·cm^3/(s·mm_{dia})]	[Pa·m^3/(s·mm_{dia})]	[mbar·l/(s·mm_{dia})]
AH	≤ 10^{-5}	≤ 1.76 x 10^{-7}	≤ 1.78 x 10^{-8}	≤ 1.78 x 10^{-7}
BH	≤ 10^{-4}	≤ 1.76 x 10^{-6}	≤ 1.78 x 10^{-7}	≤ 1.78 x 10^{-6}

Key

M_{circ} is per m stem circumference at the point of measurement.

mm_{dia} is per mm stem diameter at the point of measurement.

NOTE 1 The measured leak rate is measured using the sniffing method in accordance with 6.1 a) with the helium test fluid specified in ISO 15848-2:2015, 5.1.

NOTE 2 The minimum dilution-corrected allowable leakage rate should not be lower than 3.5 x 10-7mg/s, 2.0 x 10-7 Pa·m³/s, 2.0 x 10-6 mbar·l/s or atm·cm³/s due to the constraints of the sniffing technique.

NOTE 3 The maximum leakage rate per stem diameter is indicated in Table J.4.

NOTE 4 For the steam seal leakage rate, the probe should be held at a distance less than 3 mm from the surface and moved at a speed not exceeding 20 mm/s.

Justification

This requirement standardizes the acceptable leakage rate.

Add new Table J.3

Table J.3—Leakage Rates per Stem Diameter

OD of Stem mm (in.)	Maximum Stem Leakage Rate per Fugitive Emission Class					
	AH			BH		
	atm·cm^3/s	Pa·m^3/s	mbar·l/s	atm·cm^3/s	Pa·m^3/s	mbar·l/s
10 (0.39)	1.76 x 10^{-6}	1.78 x 10^{-7}	1.78 x 10^{-6}	1.76 x 10^{-5}	1.78 x 10^{-6}	1.78 x 10^{-5}
15 (0.59)	2.64 x 10^{-6}	2.67 x 10^{-7}	2.67 x 10^{-6}	2.64 x 10^{-5}	2.67 x 10^{-6}	2.67 x 10^{-5}
20 (0.79)	3.52 x 10^{-6}	3.56 x 10^{-7}	3.56 x 10^{-6}	3.52 x 10^{-5}	3.56 x 10^{-6}	3.56 x 10^{-5}
25 (0.98)	4.40 x 10^{-6}	4.45 x 10^{-7}	4.45 x 10^{-6}	4.40 x 10^{-5}	4.45 x 10^{-6}	4.45 x 10^{-5}
30 (1.18)	5.28 x 10^{-6}	5.34 x 10^{-7}	5.34 x 10^{-6}	5.28 x 10^{-5}	5.34 x 10^{-6}	5.34 x 10^{-5}
35 (1.38)	6.16 x 10^{-6}	6.23 x 10^{-7}	6.23 x 10^{-6}	6.16 x 10^{-5}	6.23 x 10^{-6}	6.23 x 10^{-5}
40 (1.57)	7.04 x 10^{-6}	7.12 x 10^{-7}	7.12 x 10^{-6}	7.04 x 10^{-5}	7.12 x 10^{-6}	7.12 x 10^{-5}
50 (1.97)	8.80 x 10^{-6}	8.90 x 10^{-7}	8.90 x 10^{-6}	8.80 x 10^{-5}	8.90 x 10^{-6}	8.90 x 10^{-5}
60 (2.36)	1.06 x 10^{-5}	1.07 x 10^{-6}	1.07 x 10^{-5}	1.06 x 10^{-4}	1.07 x 10^{-5}	1.07 x 10^{-4}
70 (2.76)	1.23 x 10^{-5}	1.24 x 10^{-6}	1.24 x 10^{-5}	1.23 x 10^{-4}	1.24 x 10^{-5}	1.24 x 10^{-4}
80 (3.15)	1.41 x 10^{-5}	1.43 x 10^{-6}	1.43 x 10^{-5}	1.41 x 10^{-4}	1.43 x 10^{-5}	1.43 x 10^{-4}

Justification

This table provides an example of leakage rates per stem diameter.

Add new Table J.4

Table J.4—Sampling Strategy Applied to a Purchase Order of 1055 Gate Valves with Fugitive Emission Class BH

Lot	ASME Class	DN (NPS)	Quantity	Stem Diameter, mm (in.)	Samples per Lot
1	150	15 (0.5)	136	10 (0.39)	552 x 0.02 12 valves
	150	20 (0.75)	138	10 (0.39)	
	300	15 (0.5)	226	10 (0.39)	
	300	20 (0.75)	52	10 (0.39)	
2	150	25 (1)	363	16 (0.63)	437 x 0.02 9 valves
	150	40 (1.5)	14	16 (0.63)	
	150	50 (2)	48	16 (0.63)	
	300	25 (1)	4	16 (0.63)	
	300	50 (2)	8	16 (0.63)	
3	150	80 (3)	12	19 (0.75)	54 x 0.02 2 valves
	150	100 (4)	21	19 (0.75)	
	300	80 (3)	21	19 (0.75)	
4	150	150 (6)	4	28.6 (1.13)	12 x 0.02 1 valve
	150	200 (8)	6	28.6 (1.13)	
	300	150 (6)	2	28.6 (1.13)	

Justification

N/A - Sampling Plan Example

Bibliography

Add to start of Bibliography

The following documents are informatively cited in the text of this specification, API 600, the PDS (IOGP S-611D) or the IRS (IOGP S-611L).

Add to Bibliography

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

[19] API Specification Q2, *Specification for Quality Management System Requirements for Service Supply Organizations for the Petroleum and Natural Gas Industries*

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

[21] API Standard 6DX *, *Standard for Actuators and Mounting Kits for Valves*

[22] EN 10204, *Metallic products - Types of inspection documents*

[23] IOGP S-562 *, *Supplementary Specification to API Specification 6D Ball Valves*

[24] ISO 3166-1, *Codes for the representation of names of countries and their subdivisions — Part 1: Country code*

[25] ISO 9001, *Quality management systems — Requirements*

[26] ISO 10005, *Quality management — Guidelines for quality plans*

[27] ISO 10474, *Steel and steel products — Inspection documents*

[28] ISO/IEC 17000, *Conformity assessment — Vocabulary and general principles*

[29] ISO 19901-5, *Petroleum and natural gas industries — Specific requirements for offshore structures — Part 5: Weight control during engineering and construction*

[30] ISO/IEC Directives, Part 2, *Principles and rules for the structure and drafting of ISO and IEC documents*

[31] MSS SP-25, *Standard Marking System for Valves, Fittings, Flanges and Unions*

[32] MSS SP-147, *Quality Standard for Steel Castings Used in Standard Class Steel Valves - Sampling Method for Evaluating Casting Quality*

* Cited in IOGP S-611J only.

International Association of Oil & Gas Producers

IOGP Headquarters

City Tower, 40 Basinghall Street, London EC2V 5DE, United Kingdom
T: +44 20 4570 6879
E: reception@iogp.org

IOGP Europe

T: +32 2 882 16 53
E: reception-europe@iogp.org