

Supplementary Specification to API Specification 6D for Ball Valves

Revision history

VERSION	DATE	PURPOSE
4.0	April 2026	Fourth Edition
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1.0	September 2016	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).

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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 fourth edition cancels and replaces the third edition published in January 2019. Due to technical writing requirements leading to extensive changes, this fourth edition should be treated as a new document.

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Introduction

The purpose of the IOGP S-562 specification documents is to define a minimum common set of requirements for the procurement of ball valves in accordance with API Specification 6D, 25th Edition published November 2021 and Addendum 2, published September 2024, for application in the petroleum and natural gas industries.

The IOGP S-562 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-562: Supplementary Specification to API Specification 6D for Ball Valves

This specification defines technical requirements for the supply of the equipment and is written as an overlay to API 6D, following the API 6D clause structure. Clauses from API 6D not amended by this specification apply as written. Modifications to API 6D 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-562D: Procurement Data Sheet for Ball 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-562L: Information Requirements for Ball 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-562Q: Quality Requirements for Ball 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 6D 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 6D.

1 Scope

In first paragraph, replace "axial, ball, check, gate, and plug valves" with

trunnion-mounted ball valves

Add after NOTE

This specification covers manually operated ball valves (i.e., with lever and gearbox operators, and bare stem for actuation).

This specification applies to ball valves operating within an allowable temperature range of –50 °F (–46 °C) to 302 °F (150 °C).

Add to section

Requirements related specifically to the following have not been addressed in this specification. Additional requirements or amendments to existing requirements may be needed to purchase valves of the following designs/applications:

- any other end connector that does not conform to 5.2.3;
- actuation of valves;
- valves with a minimum allowable temperature below –50 °F (–46 °C);
- high-temperature valves with a maximum allowable temperature above 302 °F (150 °C);
- buried valves with stem extensions;
- lined (plastic or rubber) valves;
- internally painted or internally coated valves;
- integral block and bleed valve manifolds with two obturators;
- valves in hydrogen (H₂) gas service.

2 Normative References

Add to first paragraph

The following publications are referred to in this specification, the PDS (IOGP S-562D) or the IRS (IOGP S-562L) in such a way that some or all of their content constitutes requirements of these specification documents.

API

Add to section

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

ASME

Add to section

ASME B1.20.1:2013, *Pipe Threads, General Purpose, Inch*

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

ASME B31.3:2022, *Process Piping*

ASTM

Add to section

ASTM A105/A105M, *Standard Specification for Carbon Steel Forgings for Piping Applications*

ASTM A106/A106M, *Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service*

ASTM A182/A182M, *Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service*

ASTM A193/A193M, *Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications*

ASTM A194/A194M, *Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both*

ASTM A216/A216M, *Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service*

ASTM A240/A240M, *Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications*

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

ASTM A276/A276M, *Standard Specification for Stainless Steel Bars and Shapes*

ASTM A350/A350M, *Standard Specification for Carbon and Low-Alloy Steel Forgings, Requiring Notch Toughness Testing for Piping Components*

ASTM A351/A351M, *Standard Specification for Castings, Austenitic, for Pressure-Containing Parts*

ASTM A352/A352M, *Standard Specification for Steel Castings, Ferritic and Martensitic, for Pressure-Containing Parts, Suitable for Low-Temperature Service*

ASTM A479/A479M, *Standard Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels*

ASTM A494/A494M, *Standard Specification for Castings, Nickel and Nickel Alloy*

ASTM A516/A516M, *Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service*

ASTM A564/A564M, *Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes*

ASTM A694/A694M, *Standard Specification for Carbon and Alloy Steel Forgings for Pipe Flanges, Fittings, Valves, and Parts for High-Pressure Transmission Service*

ASTM A705/705M, *Standard Specification for Age-Hardening Stainless Steel Forgings*

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

ASTM A995/A995M, *Standard Specification for Castings, Austenitic-Ferritic (Duplex) Stainless Steel, for Pressure-Containing Parts*

ASTM A1082/A1082M, *Standard Specification for High Strength Precipitation Hardening and Duplex Stainless Steel Bolting for Special Purpose Applications*

ASTM B443, *Standard Specification for Nickel-Chromium-Molybdenum-Columbium Alloy and Nickel-Chromium-Molybdenum-Silicon Alloy Plate, Sheet, and Strip*

ASTM B446, *Standard Specification for Nickel-Chromium-Molybdenum-Columbium Alloy, Nickel-Chromium-Molybdenum-Silicon Alloy, and Nickel-Chromium-Molybdenum-Tungsten Alloy Rod and Bar*

ASTM B564, *Standard Specification for Nickel Alloy Forgings*

ASTM B637, *Standard Specification for Precipitation-Hardening and Cold Worked Nickel Alloy Bars, Forgings, and Forging Stock for Moderate or High Temperature Service*

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 F2168:2013, *Standard Specification for Packing Material, Graphitic, Corrugated Ribbon or Textured Tape, and Die-Formed Ring*

ASTM F2191/F2191M:2013, *Standard Specification for Packing Material, Graphitic or Carbon Braided Yarn*

ASTM F788, *Standard Specification for Surface Discontinuities of Bolts, Screws, Studs, and Rivets, Inch and Metric Series*

ASTM F812, *Standard Specification for Surface Discontinuities of Nuts, Inch and Metric Series*

Add new AWS section

AWS

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

Add new EN section

EN

EN 14772:2005, *Flanges and their joints – Quality assurance inspection and testing of gaskets in accordance with the series of standards EN 1514 and EN 12560*

Add new FSA section

FSA

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

Add new IEC section

IEC

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

Add new IOGP section

IOGP

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

IOGP S-705, *Supplementary Specification to API Recommended Practice 582 Welding Guidelines for Welding of Pressure Containing Equipment and Piping*

IOGP S-715, *Supplementary Specification to NORSOK M-501 Surface Preparation and Protective Coatings*

ISO

Add to section

ISO 5211, *Industrial Valves – Part-turn actuator attachments*

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

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

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

MSS

Add to section

MSS SP-9, *Spot Facing for Bronze, Iron, and Steel Flanges*

MSS SP-101, *Part-Turn Valve Actuator Attachment - FA Flange and Driving Component Dimensions and Performance Characteristics*

3 Terms, Definitions, Acronyms, Abbreviations, Symbols, and Units

3.1 Terms and Definitions

3.1.17

drive train

Replace definition with

All parts of the valve drive from the operator to and including the closure member connection, couplings, connectors and bolted flanges that transmit or react to loads.

Add new term 3.1.55

3.1.55

bolted valve joint

Valve joint with bolted bonnet, cover or body as defined in ASME B16.34:2020, 6.4.

Add new term 3.1.56

3.1.56

component batch

A quantity of components of the same design, material, material heat number, size and rating, from a single production lot, manufactured in one location.

Add new term 3.1.57

3.1.57

corrosion allowance

Additional thickness to be added to the minimum required thickness determined in accordance with the selected standard to account for loss of material due to corrosion.

Add new term 3.1.58

3.1.58

injection point

A device that enables injection of a cleaning agent, lubricant or sealant to the ball and seat sealing surface or to the stem sealing area.

Add new term 3.1.59

3.1.59

lagging

Material used for insulation.

Add new term 3.1.60

3.1.60

lagging extension

Extension of a stem or bonnet to raise the operator above the insulation (lagging).

Add new term 3.1.61

3.1.61

maximum required operating torque

The maximum torque required to operate the valve in all cases including (but not limited to) when differential pressure equals MAWP and breakaway torque at the full temperature range for valve design.

Add new term 3.1.62**3.1.62****pressure-containing weld**

Weld between two or more pressure-containing parts, rated to the valve MAWP.

Add new term 3.1.63**3.1.63****soft-seat insert**

Nonmetallic ring that is the primary seat sealing element.

Add new term 3.1.64**3.1.64****special tools**

Non-standard tools designed by the manufacturer to perform a specific activity.

Add new term 3.1.65**3.1.65****valve batch**

A quantity of valves of the same design, material, size and rating, from a single purchase order, manufactured in one location.

3.2 Acronyms and AbbreviationsAdd to section

CS	carbon steel
DIB-1	double isolation and bleed (both seats bidirectional - DPE) valves
DIB-2	double isolation and bleed (one seat unidirectional and one seat bidirectional) valves
DSS	duplex stainless steel
EDS	element data sheet
ENP	electroless nickel plating
FEA	finite element analysis
FKM	fluoro rubber as defined in accordance with ASTM D1418 or ISO 1629
HNBR	hydrogenated nitrile butadiene rubber
LT	low temperature
LTCS	low-temperature carbon steel
MDS	material datasheet
NTCS	normal temperature carbon steel
PC	pressure-containing parts (as defined by 3.1.35)

PCTFE	polychlorotrifluoroethylene
PEEK	polyetheretherketone
PR	pressure-controlling parts (as defined by 3.1.36)
PTFE	polytetrafluoroethylene
PW	process-wetted parts (as defined by 3.1.35 excluding PC and PR)
RF	raised face
RPTFE	reinforced polytetrafluoroethylene
RTJ	ring type joint
SDSS	super duplex stainless steel
SS	stainless steel
SWG	spiral wound gasket
TCC	tungsten carbide coating
UNS	unified numbering system (alloys)
VPCI	vapor phase corrosion inhibitor

3.3 Symbols and Units

Add to section

Ra	roughness average
----	-------------------

4 Application, Configuration, and Performance

4.1 Valve Types

4.1.3 Ball Valves

Add to section

The valve closure member shall have a cylindrical port.

4.4 Valve Bore

4.4.3 Reduced-opening Valves with a Circular Opening

Replace "one of the following:" and list items a) through d) (including example) with

Table 14

Add new Table 14**Table 14—Permitted Reductions for Reduced-opening Valves**

Valve Size		Reduced-opening Requirement ^a
NPS	DN	
< 1 ½	< 40	One size below nominal size of valve with bore as per Table 1
1 ½	40	Two sizes below nominal size of valve with bore as per Table 1
2 to 2 ½	50 to 65	One size below nominal size of valve with bore as per Table 1
3	80	Two sizes below nominal size of valve with bore as per Table 1
4 to 12	100 to 300	One size below nominal size of valve with bore as per Table 1
14 to 22	350 to 550	One size below nominal size of valve with bore as per Table 1
24	600	Two sizes below nominal size of valve with bore as per Table 1
> 24	> 600	As per L.2
^a For valves that do not conform to these requirements, see K.3.2.		

Add new section**4.6 General**

Valves shall be bidirectional (see 3.1.3).

Seats shall be unidirectional self-relieving type (SPE), unless DIB-1 or DIB-2 is specified.

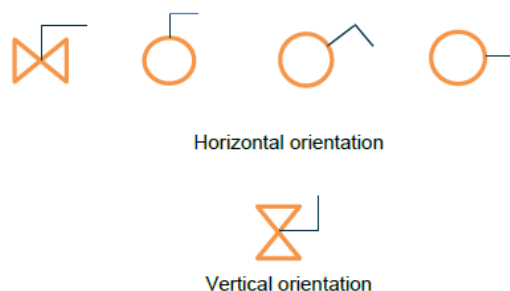
The valve shall withstand pressure applied at both ends of the valve simultaneously, with no pressure into the body cavity, without damage.

Valve sizes below NPS 2 (DN 50) shall function in any orientation.

Valve sizes NPS 2 (DN 50) and above shall function when installed in any of the following orientations (see Figure 6):

- horizontal position (horizontal flow bore) with vertical upright valve stem;
- horizontal position (horizontal flow bore) with horizontal valve stem;
- vertical position (vertical flow bore) with horizontal stem;
- any inclined position with stem orientation between horizontal and vertical upright.

NOTE 2 See K.16 for specific valve orientations.

Add new Figure 6**Figure 6—Valve Orientation**

Valve bolted connections (e.g., end connectors, bonnets) shall not require special tools for disassembly.

The purchaser shall be informed when special tools are required for disassembly or maintenance, in accordance with L.22.

For spring-loaded seat designs, the gap between the seat ring and the seat pocket shall be protected against debris accumulation to ensure that seat dynamics and seal performance are not impaired.

NOTE 3 Debris accumulation can be prevented for instance by the use of a metallic anti-debris lip.

Spring washers shall not be used for seat springs.

5 Design

5.1 General

5.1.1 Design Standards and Calculations

Replace first paragraph with

Design and calculations for pressure-containing parts and pressure-boundary bolting sizing shall conform to ASME B16.34.

NOTE See L.31 or L.32 for alternative designs using ASME BPVC, Section VIII, Division 2.

5.1.3 Pressure-controlling Parts

Add after second paragraph

Valves shall be supplied with a pressure balance hole only if specified.

Add to section

When a pressure balance hole is specified, the minimum diameter of the hole shall be 0.25 in. (6 mm) for valve sizes NPS 8 (DN 200) and smaller.

When a pressure balance hole is specified, the minimum diameter of the hole shall be 0.31 in. (8 mm) for valve sizes above NPS 8 (DN 200).

NOTE See L.23 for additional requirements on the pressure balance hole.

When a pressure balance hole is specified, the balance hole shall be positioned adjacent to the stem and top trunnion of the ball.

The operator shall be sized without considering the pressure balance hole.

5.1.4 Bolted Joint Design

Add after first paragraph

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

Pressure boundary bolting shall be tightened to achieve a preload equal to not less than 50 % of the minimum specified yield strength of the bolt material.

Where a lower preload is necessary to prevent overstressing of mating or connected components, the preload of the pressure boundary bolting shall not be more than the maximum value permitted by those components.

Add to section

Pressure-containing bolted valve joints shall be secured by stud and nut bolting, except that the bonnet cover and gland plate may be secured by cap screws.

NOTE 2 See K.17 for permissible use of cap screws.

Pressure-containing bolted valve joints shall have at least four bolts in each flange.

Pressure-containing bolted valve joints shall use bolt sizes greater than or equal to $\frac{3}{8}$ in. (10 mm) for valve sizes above NPS 1 $\frac{1}{2}$ (DN 40).

NOTE 3 See K.18 for permissible use of bolt sizes less than $\frac{3}{8}$ in. (10 mm).

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

Add new section

5.1.5 Additional Requirements for Valves Designed to ASME B16.34

Valves designed to ASME B16.34 shall meet the requirements of 5.1.5.

Minimum wall thickness calculations of ligament section around axial holes in the central core section of a two or three-piece split body shall be in accordance with ASME B16.34:2020, 6.1.2 and 6.1.3.

Wall thickness of inner ligaments shall be in accordance with ASME B16.34 plus the specified corrosion allowance.

Wall thickness of the transition from the flow passage to the central core section (e.g., for cast top entry body designs or some two-piece cast body designs) shall be in accordance with ASME B16.34 plus the specified corrosion allowance.

5.2 Dimensions

5.2.1 Standard Face-to-face and End-to-end Dimensions

Add to section

Short pattern dimensions shall only be used when specified by the purchaser.

5.2.3 End Connectors

5.2.3.1 Flanged Connectors

5.2.3.1.1 General

In second paragraph, replace "having dimensions as specified in ASME B18.2.2" with

heavy hex series nuts having dimensions as specified in ASME B18.2.2 with two threads protruding above the nut without contacting valve body parts or bolting

Add to section

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

Valve flanged ends shall be integral with the valve body or end closure forging or casting.

Welding on flanges shall not be permitted.

5.2.3.2 Weld end Connectors

Replace first paragraph with

When no weld end dimension or design code is specified, weld end dimensions shall conform to ASME B16.25.

Add to section

Valves shall be suitable for welding to pipes based on the details specified for the mating pipe.

The manufacturer shall provide the maximum allowable valve body temperature during welding and post-weld heat treatment.

When specified, valves with weld end connectors shall be provided with a pipe pup/transition piece as per L.33.

5.3 Drive Train

5.3.2 Torque/Thrust

Add to section

The operator output torque shall not exceed the MAST for the full range of maximum allowable temperatures.

5.3.3 Allowable Stress

Add to section

The load transmission calculation shall state how the load is shared (if applicable) between friction and other means (e.g., dowels).

Add new section

5.3.6 Drive Train Design and Verification

5.3.6.1 Valve Stem, Actuator Drive Adapter, and Other Cylindrical Parts Under Torsional Loads, Driven by Keys or Splines

For keyed couplings in the drive train, the torsional design of the stem shall be based on the stem cross-sectional area excluding the area of the keyed slot.

For keyed couplings in the drive train, the stem design shall withstand the bearing stress at the interface with the key.

For keyed couplings in the drive train, the key design shall account for the shear stress due to the design torque (see 5.3.2) applied at the interface between the key and the stem.

For keyed couplings in the drive train, the key design shall account for bearing stress at the interface with the stem and with the total transmitted force applied to the stem and key bearing surface.

Splined shaft design shall be based on calculated torsional stress of the minimum cross-sectional area.

5.3.6.2 Valve Bonnet / Top Plate to Body Design

If bolting is intended to resist the torque reaction of the actuator in addition to providing a pressure-containment function, the bolt stress shall produce a clamping load required to hold the bonnet / top plate in position without relative movement.

NOTE This is to ensure that drive train bolts are working with axial load and not shear.

The torque transmission design shall be based on a coefficient of friction no greater than 0.2 between the flanges, with the torque reaction acting on the bolt circle.

The torque transmission shall be ensured by a mechanical means in addition to the friction forces.

The torque transmission design shall account for the friction forces between flanges due to the bolt preload, reduced by the lifting force due to internal pressure.

If dowels are present, the torque transmission design shall account for the contribution of the dowels to the torque transmission in addition to the friction between flanges.

If dowels are present, the dowel design shall account for shear and bearing stress resulting from the design torque, in accordance with 5.3.2.

If dowels are present, the dowels housing design shall account for bearing stress.

5.4 Operations

5.4.1 Method of Operation

Add after first paragraph

The valve wrench (lever) or gearbox shall be designed and sized to operate against the MAWP.

The operator output torque shall not exceed the valve MAST.

5.4.2 Wrenches (Levers) and Hand-wheels

5.4.2.1 Torque or Thrust

Add to section

The maximum force for seating, unseating and operating shall be evaluated for the complete range of operating temperatures.

5.4.2.2 Size

Replace second paragraph with

The wrench (lever) length shall not exceed 24 in. (610 mm) or twice the face-to-face or end-to-end dimension of the valve, whichever is less.

Replace first sentence of fourth paragraph with

The hand-wheel diameter shall not exceed 32 in. (800 mm) or the face-to-face or end-to-end dimension of the valve, whichever is less.

Add new section

5.4.2.3 General

The nut for the wrench (lever) or hand-wheel shall have a secondary locking feature (e.g., additional nut or retention pin).

Wrenches (levers) and hand-wheels shall be free from burrs and sharp edges.

5.4.3 Position Indicators

5.4.3.1 General

Add to section

The gearbox position indicator shall be connected to the stem in a manner that prevents incorrect installation and false indications of the port position.

The gearbox position indicator shall be legible after coating of valve.

The gearbox position indicator shall not be visually obstructed by other valve components.

The gearbox attachment to the valve shall be provided with means (e.g., guide pin) to ensure re-assembly to the same position indicated by the position indicator.

Position indicators on the valve and/or gearbox shall not be secured by grub screws or set screws.

On completion of final valve assembly and test, valves supplied with gearboxes shall have two pins or rivets installed in line on the flanges between the valve and gearbox to indicate the "as-assembled" condition.

5.4.4 Travel Stops

Add to section

Valves operated with a gearbox shall have a travel stop on the gearbox, i.e. not on the valve.

Replace section 5.4.5 title with

5.4.5 Operators and Stem Extensions

5.4.5.1 General

Add to section

Mechanical means (e.g. dowel pin) shall be used to ensure the proper assembly of operators and stem extension assemblies in the required location.

5.4.5.3 Overpressure Protection

Add to section

The relief device for prevention of overpressure of the operator shall be made from a corrosion-resistant material.

Add new section

5.4.5.5 Gearbox Requirements

Gearboxes shall have a protection class of IP65 in accordance with IEC 60529.

NOTE See L.34 for alternative protection classes for the gearbox.

Gearboxes shall be equipped with injection fittings and a weatherproof vent connection, to enable lubrication of rotating parts.

External shafts shall be manufactured from a corrosion-resistant material.

Gearbox components shall be lubricated such that all moving parts are immersed in lubricant.

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

The assembly of gearboxes shall only have two orientations 180° apart.

Gearboxes shall be a self-locking design that holds position (e.g., worm and wheel design).

The output of the gearbox, at an input torque given by a force equal to 1.5 times 80 lbf (360 N) and applied at the rim of the hand-wheel, shall not produce stresses that exceed the stress limits of the drive train specified in 5.3.3.

The dimensions of the gearbox flange shall be in accordance with ISO 5211 or MSS SP-101.

Body/bonnet closure bolting shall not be used to directly mount a gearbox to the valve.

Valves with nominal ball bore sizes equal to or greater than those specified in Table 15 shall have gearboxes fitted.

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

The dimensions of the gearbox shall not exceed the limitations specified for hand-wheels (see 5.4.2.2).

If the number of hand-wheel turns exceeds 100 from the fully open position to the fully closed position, the number of hand-wheel turns shall be specified on the quotation.

A clearance of 3 in. (75 mm) shall be maintained between the outermost edge of a wrench (lever) or hand-wheel and components within the range of motion of the wrench (lever) or hand-wheel.

Add new Table 15

Table 15—Minimum Nominal Ball Bore Sizes at which a Gearbox is Required

Class	Nominal Ball Bore Size ^a	
	NPS	DN
150	≥ 6	≥ 150
300	≥ 6	≥ 150
600	≥ 6	≥ 150
900	≥ 4	≥ 100
1500	≥ 3	≥ 80
2500	≥ 2	≥ 50
^a Refer to Table 1 for minimum bore sizes.		

5.5 Cavity Relief

Replace fourth and fifth paragraph with

The valve cavity relief pressure shall not exceed the lower of 33 % of the valve pressure rating or 435 psig (30 bar).

Add to section

With the exception of DIB-1 valves, valve cavity pressure relief shall be achieved by self-relieving seat rings that internally relieve excess pressure from the valve cavity.

When cavity relief is specified for valves with DIB-1 functionality, the cavity relief system shall be provided for purchaser acceptance.

NOTE 3 DIB-1 valves have the potential to trap pressure in the cavity of the ball, and a pressure balance hole could be required.

5.6 Body Penetrations

5.6.1 Vents and Drains

Add after first paragraph

Valves with bore sizes NPS 4 (DN 100) and larger shall have a vent and a drain except when specified in conformance with M.3.2.

Add note after second paragraph

NOTE See L.35 for permitted vent and drain connectors.

Add new section

5.6.1.1 Drain and Vent Standard Connections

When installation orientation is not specified, the vent and drain connections shall be at the highest and lowest positions respectively, on the valve body cavity, considering the body in the horizontal and stem in the vertical positions.

When installation orientation is specified, the drain connection shall be at the lowest possible position on the valve body cavity of the specified orientation.

When installation orientation is specified, the vent connection shall be at the highest possible position on the valve body cavity of the specified orientation.

Plugs and fittings shall have a MAWP that is not less than the valve rated pressure.

Plugs and fittings shall withstand the valve hydrostatic shell test pressure.

Plugs, fittings and blinds shall have dimensions in accordance with a recognized industry standard.

Wall thickness of connection areas shall be in accordance with ASME B16.34.

On a CRA clad valve where drain ports breach the CRA layer, the drain and vent ports shall be fitted with a welded nickel-based alloy insert that has an integral shoulder on the valve cavity side to prevent blow-out in case of attachment weld failure.

NOTE See K.19 for alternative vent and drain port designs of CRA clad valves.

Welds of the nickel-based alloy insert for vent and drain ports of CRA clad valves shall be pressure-containing welds in accordance with ASME BPVC, Section VIII, Division 1 or ASME BPVC, Section VIII, Division 2.

If PWHT is required on the seal weld, seal welding of threaded connections shall not be permitted.

Parallel threaded plugs shall have an external cylindrical surface to accept a seal weld.

Add new section

5.6.1.2 NPT Tolerance and Torque Control

PTFE tape shall not be used on threaded connections.

Hand-tight engagement of NPT connections shall be in accordance with ASME B1.20.1:2013, Table 2.

Final torques shall meet the accepted documented torques using a calibrated torque wrench.

Thread sealant shall be free of ingredients that cause corrosion of the plug and housing materials.

5.6.1.3 Seal Welds

Thread sealant shall be removed prior to seal welding.

Seal welding of threaded plugs shall be considered a pressure-containing weld.

Seal welding of threaded plugs shall consist of not less than two passes with rotating starts and stops.

Seal welding shall have a welding dimension not less than Cx in accordance with ASME B31.3:2022, Figure 328.5.2-3.

When the fitting to be seal welded does not have a specified wall thickness, Cx shall be based on Sch 160 or $\frac{3}{16}$ in. (4.76 mm), whichever is greater.

Seal welding qualification shall be in accordance with ASME B31.3 for an equally-sized socket weld.

NDE for seal welds shall comply with QSL2 requirements.

Add new section

5.6.1.4 Locking Rings for Plugs

Parallel thread plugs shall be locked with a locking ring to prevent loosening.

The locking ring shall be secured to the valve body.

The locking ring shall be removeable without loosening the plug.

5.6.2 Injection Points

Replace first sentence with

Injection fittings shall only be provided when specified.

In first list section, replace "Seat injection points" with

Seat and stem/shaft injection points

Add new NOTE after first list section

NOTE 1 See K.20 for alternative stem/shaft injection point arrangements (e.g., when the gland is not thick enough to house an independent non-return valve).

In second list section, replace "protective cap/plug" with

protective threaded cap/plug

Delete "and shall include a fitting inclusive of a non-return valve and a pressure-containing cap/plug" from third list item

Add new list sections after third list section

- Graphite fire-safe seals shall not be considered as a primary sealing barrier.
- For valves supplied with a stem sealing lip seal, the seal shall be of anti-collapse design such that injection of a sealant does not compromise the integrity of the lip seal.

Add new list sections after fifth list section

- Injection fitting internals shall be of an anti-blow-out design and fully contained within the fitting body.
- Injection fitting spring shall not exceed yield stress in the fully-compressed state of the spring.

Add new list sections

- Non-return valves shall be metal-seated and contain a tungsten carbide ball with a UNS N06625 spring.
NOTE 2 See K.20 for alternative ball and spring materials in the non-return valves.
- Minimum wall thickness of connection areas shall be in accordance with ASME B16.34.
- Injection points shall be capable of withstanding the valve hydrostatic shell test pressure.
- The MAWP of injection fittings shall be provided.
- Injection points shall be in compliance with ASME BPVC, Section VIII or API 6A:2018, 9.2 and 9.3.
- A minimum of two injection fittings per seat, equally spaced around the perimeter starting from the horizontal axis, shall be provided for valve sizes NPS 16 (DN 400) and larger.
- On a CRA clad valve where injection points breach the CRA cladding layer, the injection points ports shall be fitted with a welded nickel-based alloy insert that has a means (e.g., threaded insert) to prevent blow-out in case of attachment weld failure.

The seat injection system shall provide a homogeneous distribution of sealant or cleansing compound between the seat and the ball.

5.7 Stem Retention

Add to section

Stem retention shall be achieved by an integral stem shoulder.

5.8 Antistatic

Add to section

Graphite seals shall not be an acceptable means for establishing electrical continuity.

5.9 Lifting

Add after second paragraph

The mandatory safe lifting points and SWL of individual lifting lugs shall be marked on the valve.

The total weight of the valve shall include the manual operator (e.g., a gearbox with a hand-wheel or lever) and accompanying valve accessories.

Add to section

Lifting point design shall be verified through type testing carried out by lifting the load to the SWL, or by calculation.

Permanent lifting points shall be provided for valves of NPS 8 (DN 200) and above.

Permanent lifting points shall be provided for valves weighing more than 550 lbs (250 kg).

Acceptable designs of lifting points shall be as follows:

- forged lifting lugs welded to valve body/bonnet;
- integral forged/cast lifting lugs;
- single piece plate lifting lugs connected to at least two pressure-retaining bolts;
- lifting eye bolts threaded into the valve body/bonnet.

Lifting instructions for the valve shall not utilize lifting points on the gearbox.

When the valve orientation is not specified, lifting point position design shall be based on the valve being lifted in the stem-upright position.

When the valve orientation is specified, lifting point position design shall be based on the valve being lifted in both the stem-upright position and the specified valve orientation.

Lifting points shall not be manufactured from cast iron or a ductile iron material.

Lifting point materials shall be selected to prevent galvanic corrosion.

Prevention of galvanic corrosion of lifting points shall not be by coating.

Add new section**5.11 Pigging**

When piggability is specified, the specified bore shall continue throughout the entire valve (i.e., the valve, the transition piece and the pipe pup).

NOTE See K.21 for other bore options with smooth transition, to avoid purchasing a bespoke valve where a standard valve can be used.

Snagging areas between the seat and the ball shall be prevented.

Debris collection between the seats and the ball shall be minimized.

Vertical ball movement shall be prevented to avoid damage to the seat inserts.

When a dragging force is specified, the seat spring compression shall withstand the specified dragging force without displacing the seats and associated parts.

Add new section**5.12 Stem Design**

The stem design shall prevent galling by the use of a stem bearing.

The stem shall be constructed from a single piece of wrought material.

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

The stem shall be straight over its end-to-end length, within a tolerance of 0.012 in./ft (1 mm/m).

The stem sealing area shall be free from any defects.

The stem sealing area in contact with polymer materials, other than lip seal or V-packing, or elastomer materials shall have a surface finish, Ra, less than or equal to 16 $\mu\text{in.}$ (0.40 μm).

NOTE See 5.15.2 for lip seal and V-packing surface finish requirements.

The stem sealing area in contact with graphite shall have a surface finish, Ra, less than or equal to 32 $\mu\text{in.}$ (0.80 μm).

The stem shall be supported and have a clearance gap to avoid rubbing contact with the adjacent static metallic components (e.g., bonnet, gland ring).

The clearance gap between the stem and the adjacent static metallic components shall be sized for the side loads.

Add new section**5.13 Securing of Internal Valve Parts**

Removeable valve parts at risk of being lost through the valve bore shall be secured against loosening.

Press fit assemblies, spring tension pins and tack welds shall not be used for securing of internal valve components.

Add new section**5.14 Soft-Seat Insert Design**

If not specified, the soft-seat materials shall be selected in accordance with Table 16.

Add new Table 16**Table 16—Soft-seats**

Class	Type ^a
150, 300 and 600	RPTFE / PEEK / PCTFE
900	PEEK / PCTFE
1500	PEEK / PCTFE
2500	PEEK
^a TCC or ENP shall be applied to the ball when PEEK seats used.	

Soft-seat material and design shall be compatible with the MAWP for the specified temperature range.

If the temperature is not specified, soft-seat materials shall be fully operable for the MAWP at a temperature up to 302 °F (150 °C).

If the materials in Table 16 are inadequate for the MAWP or not chemically compatible with the process fluids at the specified temperature range, alternative soft-seat materials shall be proposed for purchaser acceptance.

Add new section**5.15 Sealing Rings****5.15.1 Elastomers**

Elastomer O-rings shall be fully operable at the valve design rated pressure for the specified temperature range of the valve and the use of O-rings limited to temperatures of -20 °F (-29 °C) and above.

NOTE See K.22 for acceptable use of elastomeric O-rings at temperatures below -20 °F (-29 °C).

The elastomer O-ring material grade and brand name shall be provided.

For valves Class 600 and above, the size of the O-ring section for elastomers shall be qualified for resistance to RGD at the MAWP or above.

When RGD resistance is specified for seals, the size of the O-ring section for elastomers shall be no greater than 0.275 in. (6.99 mm).

NOTE 2 See K.23 for permissible use of a larger RGD resistant elastomer O-ring section when specified by the purchaser.

NOTE 3 See L.6 for O-ring seal qualification testing requirements.

NOTE 4 See K.24 for elastomer O-ring RGD qualification at alternative pressures when specified by the purchaser.

When qualifying elastomers for resistance to RGD in accordance with ISO 23936, a damage rating of 0 shall be achieved.

Elastomeric seal rings shall be fully contained.

5.15.2 Lip seals and V-packing seals

Lip seals or V-packing (chevron) seals shall be used if no elastomeric materials are compatible for the specified valve temperature range and service.

Lip seals and V-packing (chevron) seals shall only be used on metallic surfaces of corrosion-resistant material or with a corrosion-resistant overlay.

Polymers in lip seals shall be reinforced PTFE (RPTFE).

Lip seals shall have an anti-collapse design incorporating a support ring made from RPTFE, PEEK or metal designed for a backpressure equal to the MAWP.

The lip seal housing shall prevent the lip seal from being dislodged by backpressure.

Lip seals with an anti-collapse ring made from RPTFE shall not be permitted for valves Class 600 and above.

Springs and metal support rings used in lip seals shall be constructed from UNS N06625, R30003 or R30035.

Metallic surface areas in contact with lip seals shall have a surface finish in accordance with the seal manufacturer's recommendation.

The lip seal arrangement shall not have two face-to-face lip seals with the open ends facing each other.

Designs using lip seals with open ends oriented in opposite directions (see example in Figure 7) shall only be proposed if previously validated by successfully performing tests in accordance with L.11.

Add new Figure 7

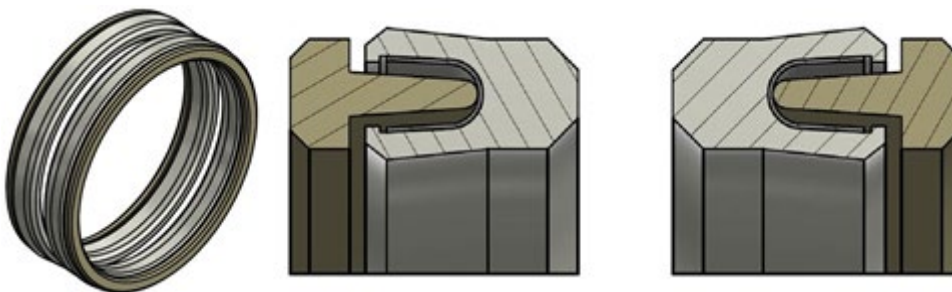


Figure 7—Lip Seals, Back-to-back Configuration

5.15.3 Seals in Vacuum Conditions

Valves with nonmetallic (soft) seals shall withstand vacuum drying during maintenance at absolute pressures down to 0.001 psia (10 Pa).

Add new section

5.16 Stem Seals, Stuffing Box, and Gland

Sealing surfaces shall have a surface finish in compliance with the seal OEM recommendations.

Stem primary seals shall be self-energizing.

Stem seal arrangements consisting of only a single O-ring or lip seal shall not be permitted for valves Class 600 and above.

Graphite fire-safe seals shall not be considered as a secondary seal in the stem seal arrangement.

Add new section

5.17 O-ring Housing Design

For seals with toroidal sealing rings (O-rings), groove design dimensions shall be based on achieving a groove filling ranging from 75 % to 85 % unless supported by approved RGD testing.

The radial sealing housing design of elastomeric O-rings shall use thermoplastic back-up rings on both sides for valves at pressure of Class 900 and above.

Thermoplastics in elastomeric O-ring back-up rings shall be PEEK or reinforced PTFE.

Add new section

5.18 Fire Testing

Valves shall be qualified by fire testing in accordance with L.27.

NOTE See K.25 for valves not qualified by fire testing.

Add new section

5.19 Finite Element Analysis (FEA)

For metal-seated valves, FEA shall be performed in accordance with Table 17 for the ball-to-seat and seat-to-body interfaces.

With full differential pressure applied, the FEA of metal-seated valves shall demonstrate that:

- the required seat-to-ball contact is maintained;
- materials remain within the elastic limit; and
- freedom of movement is preserved.

FEA shall be performed using an elastic-plastic analysis to satisfy the service criteria described in ASME BPVC, Section VIII, Division 2.

NOTE ASME BPVC, Section VIII, Division 2 service criteria require verification for operability, functionality, and integrity through the valve at the operating pressure and temperature ranges.

Add new Table 17**Table 17—Metal-Seated Valves That Require FEA**

Class	Nominal Ball Bore Size	
	NPS	DN
150	≥ 20	≥ 500
300	≥ 20	≥ 500
600	≥ 20	≥ 500
900	≥ 20	≥ 500
1500	≥ 16	≥ 400
2500	≥ 12	≥ 300

Add new section**5.20 Locking Provision**

Manually operated valves shall have a provision for locking the valve in the open and closed positions as per L.26.

6 Materials**6.1 Metallic Requirements****6.1.1 General**Add to section

Materials selected for valves and valve parts shall comply with IOGP S-563.

Where there is no applicable MDS or EDS in IOGP S-563, the material shall comply with an industry-recognized material standard.

UNS N07718 age-hardened nickel-based alloy shall comply with API 6ACRA.

Galling between the contacting surfaces of stem, sliding elements and threaded components shall be prevented by having a differential hardness or surface treatment.

NOTE 3 Required differential hardness to prevent galling varies depending on materials. 50 HBW hardness differential is considered as a general recommended practice.

When a corrosion allowance of 0.12 in. (3 mm) or greater is specified, a CRA weld overlay shall be applied to sealing areas in accordance with 7.5.3 and the applicable IOGP S-563 EDS.

NOTE 4 For small sizes, CRA overlay may not be possible therefore valve parts may be proposed as solid CRA material subject to suitability of pressure rating.

If a CRA weld overlay is not possible due to the small size of the valve, valve parts may be proposed as solid CRA material subject to suitability of the pressure rating.

When full CRA weld overlay (cladding) is specified, CRA weld overlay shall be applied on wetted body surfaces and sealing areas in accordance with 7.5.3 and the applicable IOGP S-563 EDS.

6.2 Nonmetallic Requirements

Replace second paragraph with

Elastomeric materials for valves at pressures of Class 600 and above shall be resistant to RGD in accordance with L.6.

6.5 Impact Test

Replace seventh paragraph with

Impact test results for full-size specimens shall meet the more stringent requirements (i.e., highest energy and lowest test temperature) of the following:

- MDS and Table 4;
- MDS and Table 5.

NOTE 3 For alternative acceptance criteria for Charpy V-notch impact toughness testing of 20 Cr Group B, 22 Cr, 25 Cr and 27 Cr materials see L.36

6.6 Sour Service

Add after first paragraph

When specified for sour service, alloy 625 material shall have hardness not exceeding 35 HRC.

Add new NOTE 2

NOTE 2 See L.37 for the option for the use of ANSI/NACE MR0103/ISO 17945 in sour service.

6.7 Body Penetrations

Replace section with

Materials for drain, vent, injection and auxiliary connections shall meet the requirements of 6.7.

Welded plugs material, fittings material and the plug port material shall have the same P-No, in accordance with ASME BPVC, Section II, Part D.

The material of non-welded removable plugs and fittings shall be equal to that of the valve trim material.

If the trim material has an inferior corrosion-resistance grade to 316 stainless steel, non-welded removable plugs and fittings shall be 316 stainless steel.

NOTE 1 Silver plating (see SAE AMS 2410) the threaded portion of the plug can prevent galling between austenitic or duplex/super duplex plug and body materials.

The drain/vent auxiliary blind flange shall be made of a forging material equivalent (i.e., the same B16.34 material group) to the body material.

NOTE 2 See K.26 for alternative drain/vent auxiliary blind flange materials for carbon steel and low temperature carbon steel valves.

Austenitic stainless steel gaskets (e.g., spiral wound or ring joint) shall pass an intergranular corrosion test in accordance with ASTM A262, Practice E.

Expanded graphite filler materials of spiral wound gaskets shall be in accordance with 6.10.

PTFE filler materials of spiral wound gaskets shall be in accordance with ASTM D4894 or ASTM D4895.

Gasket materials shall be selected in accordance with Table 18.

Add new Table 18

Table 18—Gasket Materials for Drain, Vent, Injection, and Auxiliary Connections

Body Material	NTCS		LTCS			SS 316	DSS	SDSS	Alloy 625
	ENP Trim	SS Trim	ENP Trim	SS Trim	Cladded				
RF	SWG 316 + graphite	SWG 316 + graphite	SWG 316 + graphite	SWG 316 + graphite	SWG 625 + graphite	SWG 316 + graphite	SWG DSS + graphite ^a	SWG SDSS + graphite ^a	SWG 625 + graphite ^a
RTJ ^b	Octagonal soft iron	Octagonal soft iron	Octagonal soft iron	Octagonal soft iron	Octagonal alloy 625	Octagonal SS 316	Octagonal DSS	Octagonal SDSS	Octagonal alloy 625
^a For seawater service, when fire-safe gaskets are required, RTJ gaskets shall be used, otherwise use "SWG + PTFE". ^b Hardness of gasket material shall be less than the flange material.									

Parallel threaded plugs shall have a primary seal (i.e., an elastomeric O-ring or a thermoplastic lip seal inboard of the thread) to protect the thread against crevice corrosion.

The primary inboard seal material and the main valve static primary seal material on parallel threaded plugs shall have the same service compatibility.

The axial seal connection between the parallel threaded plug and the body shall provide a fire-safe graphite seal outboard of the thread.

When a metallic seal ring is used on a parallel threaded plug, the seal material shall be the same as the trim material.

If the trim material grade has inferior corrosion-resistance properties than 316 stainless steel, the metallic seal ring used on a parallel threaded plug shall be 316 stainless steel.

The parallel threaded plug locking ring material and body securing parts materials shall be 316 stainless steel.

Add new section

6.9 Valves Manufactured from Bar Material

Bar material selected for valve parts shall be in accordance with ASTM A961.

Hollow cylindrically shaped pressure-containing parts shall only be manufactured from hot-rolled, hot-rolled and cold-finished, or forged round bar if permitted by the material standards of the final form.

The body to integral flange transition radius shall be at least 0.4 in. (10 mm) when bar material is used.

Add new section**6.10 Graphite Materials**

Flexible graphite and die-formed rings shall be in accordance with ASTM F2168 with supplementary requirements S3, S6.1, S6.2 and S10.

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

Active (sacrificial) corrosion inhibition using zinc shall not be permitted.

The chlorine content of graphite material shall not exceed 50 ppm.

The fluorine content of graphite materials shall not exceed 10 ppm.

The halogen content of graphite materials shall not exceed 310 ppm.

Graphite oxidation testing shall be performed in accordance with EN 14772:2005, 6.7 or FSA-G-604-07.

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

Add new section**6.11 IOGP S-562 Material Class**

The valve component materials shall be in accordance with the "IOGP S-562 material class", as specified in Annex N.

NOTE See K.27 for acceptable materials combinations not listed in Annex N.

7 Welding**7.5 Weld Overlay****7.5.1 General**Add new NOTE

NOTE See L.37 for the requirements when ANSI/NACE MR0103/ISO 17945 is specified.

7.5.3 Corrosion-resistant Alloy (CRA) Weld Overlays**7.5.3.1 General**Add to section

CRA weld overlay shall extend beyond the two sides of sealing areas by 0.12 in. (3 mm) or the specified corrosion allowance, whichever is greater.

Add new section**7.5.3.3 Stainless Steel Weld Overlay****7.5.3.3.1 Applicability of IOGP S-563:2021, Table B.6**

Stainless steel weld overlay shall be in accordance with IOGP S-563:2021, Table B.6 with the exceptions and additions detailed in 7.5.3.3.2 through 7.5.3.3.4.

7.5.3.3.2 Exception to IOGP S-563:2021, Table B.6—Welding, Welding Consumables

Welding consumable shall be of type 309LMo for the first layer and type 316L for the remaining (top) layer(s).

7.5.3.3.3 Exception to IOGP S-563:2021, Table B.6—Procedure Qualification Testing, Chemical Composition

The specified chemical composition of the 316L filler metal shall be met at a depth of at least $\frac{1}{16}$ in. (1.5 mm) from the minimum qualified overlay thickness.

7.5.3.3.4 Addition to IOGP S-563:2021, Table B.6—Procedure Qualification Testing

When PWHT is required, corrosion testing in accordance with ASTM A262 practice E shall be part of the weld procedure qualification test.

Add new section**7.5.3.4 Alloy 625 Weld Overlay**

Alloy 625 weld overlay shall be in accordance with IOGP S-563:2021, Table B.6.

Replace section 7.10 title with**7.10 NDE—Pipe Pressure-containing Welds**

In first paragraph, replace "pressure-containing pipe pup-to-valve welds" with

pressure-containing butt welds

In second paragraph, replace "pressure-containing pipe pup-to-valve welds" with

pressure-containing butt welds

7.11 Manufacturing Repair**7.11.2 Casting Repair at the Manufacturer**

In third paragraph, delete "on pressure-containing parts"

Add after third paragraph

RT or UT shall be performed on major repair welds (see API 20A for definition) on pressure-containing cast parts.

Replace fourth paragraph with

Weld repair of castings shall be in accordance with the applicable MDS in IOGP S-563.

Weld repair shall not be permitted for castings that leak during pressure testing.

7.11.4 Repair of Welds

Add to section

Repair of welds shall be performed in accordance with a documented procedure specifying requirements for defect removal, welding, heat treatment and NDE.

Add new section

7.12 Ferrite Content

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 pipe pups and valve bodies).

The percentage ferrite range shall be verified using a ferrite content meter of a type accepted by the purchaser.

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

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

Ferrite content measurements shall be undertaken on the OD for at least three locations equally spaced around the circumference.

Coatings and surface oxide shall be removed.

The test location shall be ground to Ra, less than or equal to 52 µin. (1.3 µm) prior to the test.

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

8 Bolting

8.1 Pressure-boundary Bolting

Replace second paragraph with

Bolting materials shall conform to IOGP S-563.

Add to section

Carbon and low-alloy steel bolting shall be coated, as specified in the PDS.

For bolting size 0.39 in. (10 mm) and below, CRA bolting shall be used.

9 Quality Control

9.1 Measuring and Test Equipment Control

9.1.1 Control

Add to section

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

Personnel performing NDE evaluation shall be certified in accordance with Level 2.

NDE personnel shall be certified by an independent third-party certification body or authorized qualifying body in accordance with ISO 9712 or the ASNT Central Certification Program (ACCP).

9.3 Welding Inspectors

Replace section with

Personnel performing inspections of welding operations and completed welds shall be qualified and recorded in accordance with IOGP S-705.

9.4 Visual Inspection

9.4.2 Visual Inspection of Castings

Add before first paragraph

Visual inspection of castings shall conform to the applicable MDS in IOGP S-563.

9.4.4 Visual Inspection of Finished Machined Parts

Add after first paragraph

Surfaces of finished CRA components shall be free of surface contamination (e.g., debris, dirt, weld spatter).

Add new section

9.7 Visual Examination Personnel

NDE shall conform to the requirements of Table 19 or, when a QSL is specified, Table I.1.

Add new Table 19**Table 19—NDE Requirements**

Part	Cast	Wrought ^e
Body or closures and end connections or bonnet or cover or gland housing ^g or integral lifting lugs	VT1 and VT5	VT2 and VT5
Weld ends ^a	VT1 and VT5	VT2 and VT5
	MT1 or PT1	MT1 or PT1
	RT3 or UT4	UT2
Stem or shaft ^b	N/A	VT5
Trunnion ^c and trunnion/bearing plates	VT1 and VT5	VT2 and VT5
Pressure-boundary bolting	N/A	VT4 ^g
Ball ^b and seat rings ^b	VT1 and VT5	VT2 and VT5
Corrosion-resistant overlay in final supplied condition	VT3	
	PT1	
Welds ^d to pressure-containing parts	VT3	
	MT1 or PT1	
Hard facing	VT4	
Sealing surfaces	VT5	
Seals, gaskets and seat springs	VT4	
Pressure-containing welds (except seal welds)	VT3	
	MT1 or PT1	
	RT2 ^f	
Plating	VT4	
NOTE See Table I.2 for the specification of the examinations referred to in this table.		
^a A band around each weld end extending back from the body end a distance equal to the greater of 3 times wall thickness (t _m) or 2.75 in. (70 mm). See ASME B16.34 for the definition of wall thickness (t _m).		
^b MT or PT to be performed prior to coating, plating or overlay.		
^c The trunnion may be pressure-containing or pressure-controlling, depending on the design type. If the trunnion is a pressure-containing part, the requirements for body shall apply.		
^d These include seal, fillet, attachment, reinforcing, stiffening welds, etc.		
^e Wrought material applies to bar, forgings and plate.		
^f Where RT2 is not possible, UT3 shall be performed.		
^g VT examination shall cover all areas of threads, shanks and heads. Discontinuities shall comply with the requirements specified in ASTM F788 for bolts/studs and ASTM F812 for nuts.		

10 Factory Acceptance Testing

10.1 Pressure Testing—General

10.1.1 Procedure

Add after second paragraph

When orientation is specified, valve testing shall comply with L.21.

When orientation is not specified, valves NPS 10 (DN 250) and larger shall be tested with horizontal flow bore and stem vertical upward.

Replace last paragraph (including list items) with

Testing shall conform to the requirements and the sequence order of Table 20, or when a QSL is specified, Table I.4.

Add new Table 20

Table 20—FAT Requirements

Sequence	Type	Minimum Testing Frequency
1 ^{a, c}	Antistatic testing as per L.5	One valve per valve batch
2 ^d	Hydrostatic shell test as per 10.3 as follows: — standard as per 10.3.1; — higher as per 10.3.2; — with external relief as per 10.3.3; — with pipe pups as per 10.3.4; — with drain, vent, and sealant injection lines as per 10.3.5.	All valves when applicable
3 ^c	Torque or thrust test as per I.6	One valve per valve batch (only for valves supplied bare stem)
4 ^c	Functional test per I.6 with operator at 1.0 times the rated pressure as per I.6.1	One valve per valve batch (when torque test is not performed)
5 ^b	High-pressure hydrostatic seat test at 1.1 times the rated pressure as per 10.4	All valves
6	DBB/DIB testing as per 10.4.4	All valves when applicable
7	Low-pressure gas seat test Type II at 80 psi (6 bar) to 100 psi (7 bar) as per I.9	All valves
<p>NOTE Refer to 10.6 for end thrust effect test requirements.</p> <p>^a For valves that are already in stock and that do not have any antistatic test documentation, the antistatic test may be done later.</p> <p>^b Hydrostatic seat testing may be replaced by high-pressure gas seat testing as per I.8.3, when specified by the purchaser.</p> <p>^c If a selected sample valve fails a test, two additional sample valves from the same batch shall be tested. If any of the additional sample valves fail the test, a structured root cause analysis, corrective action and preventative action report shall be submitted for acceptance. Valves in the failed valve batch shall be subsequently tested.</p> <p>^d Body joints bolting preload shall be verified after successful completion of body pressure testing.</p>		

10.1.2 Test Conditions

Add to first paragraph

The pH of the water shall be between 6 and 8.5.

10.3 Hydrostatic Shell Test

10.3.1 Hydrostatic Shell Test Preparation, Method, and Acceptance Criteria

Add to section

Drains, vents, sealant injection internal non-return valves, additional connections and blind flanges that form part of the final assembly shall be subjected to the hydrostatic test with the valve.

On completion of the test, sealant injection internal non-return valves shall not be removed.

Injection fittings shall be installed after completion of the pressure testing requirements.

The valve shall be isolated from the supply pressure source.

10.4 Hydrostatic Seat Test

10.4.1 Hydrostatic Seat Test Preparation, Method, and Acceptance Criteria

Replace sixth paragraph (including list items) with

The acceptance criteria for seat leakage rates for hydrostatic seat test and low-pressure gas seat test shall conform to Table 21.

Add new Table 21

Table 21—Seat Test Acceptance Criteria

Ball Valve Type	Hydrostatic Seat Test Maximum Leak Rate ^{b, c}	Low-pressure Gas Seat Test Maximum Leak Rate ^c
Soft-seated	A	A
Metal-seated ^a	B	B
NOTE See K.28 for alternate acceptance criteria to those specified in Table 21 for metal-seated valves. ^a The acceptance criteria are applicable to seat testing when the pressure is applied from one valve end only and also to DIB-2 testing when pressure is applied from one valve end and the cavity. ^b The acceptance criteria are applicable to DBB testing when the pressure is applied from both ends simultaneously shall be double the listed values. ^c Leakage rates as per ISO 5208.		

10.4.3 Hydrostatic Seat Test—Axial On-Off, Ball, Gate, and Plug Valves

10.4.3.2 Bidirectional Valve

Add after second sentence

The valve shall be isolated from the supply pressure source with the volume beyond the pressurized seat being at atmospheric pressure.

No decrease in the water level from the leakage detection device shall be allowed.

The volume on the valve end of the non-tested seat shall be isolated, if not used for measuring leakage.

Add to section

No draining shall be allowed from the valve body cavity or from the downstream side of the valve during the hydrostatic seat test.

Add new section

10.6 Testing Valves with End Load

The valve tests listed in Table 20 and Table I.4 shall be subjected to the end load test requirements in accordance with Table 22.

To perform the end load test, the valve shall be fitted with end connections that allow the full pressure thrust load to act on the valve body joints (e.g., blind flanges, welded-on caps, blind caps).

If a selected sample valve fails a test, two additional sample valves from the same batch shall be tested.

If any of the additional sample valves fail the test, a structured root cause analysis, corrective action and preventative action report shall be submitted for acceptance.

Valves in the failed valve batch shall be subsequently tested.

Add new Table 22**Table 22—Number of Valves per Batch for End Load Testing**

Valve Size		Pressure Class					
NPS	DN	150	300	600	900	1500	2500
2	50						
3	80						
4	100						1
6	150					1	1
8	200				1	1	1
10	250			1	1	1	1
12	300			1	1	1	1
14	350		1	1	1	1	All
16	400	1	1	1	1	1	All
18	450	1	1	1	1	1	All
20	500	1	1	1	1	1	All
22	550	1	1	1	1	1	All
24	600	1	1	1	1	1	All
≥26	≥650	All	All	All	All	All	All

Key

1 1 valve per batch.

All All valves per batch.

NOTE 1 Valve selection is made at random by the purchaser.

NOTE 2 End load testing may be performed as part of the basic pressure testing listed in Table 20 or Table I.4.

NOTE 3 For weld end valves, the number of valves per batch for end load testing may be reduced in accordance with K.29

11 Coating/PaintingAdd to first paragraph

Valves and valve parts shall be painted using the coating systems and coating products specified.

Add new NOTE 3 after NOTE 2

NOTE 3 IOGP S-715 is a preferred coating specification used by the oil and gas operating companies for valves in offshore and marine coastal environments.

12 Marking

12.1 General

Table 12—Additional Marking

Add row Item No. 5

Item No.	Marking	Format	Location
5	Nominal wall thickness on weld end valves	Sch. 80 or XS or 0.5 in. (12.7 mm)	On body weld ends

Add to section

Marking on the valve bodies, end connector and bonnet/cover shall not be located on weld bevels, flange faces or surfaces that can be hidden following fabrication, assembly or installation.

12.3 Nameplate

In second paragraph, replace "an austenitic stainless-steel" with

a 316 austenitic stainless steel

Table 13—Valve Marking on Nameplate

In row Item No. 13, add reference to Footnote ⁱ after "QSL, when specified"

QSL, when specified ⁱ

Add new rows Item no. 15 and Item no. 16

Item No.	Marking	Section	Format Example
15	Nominal wall thickness on weld end valves ^h	— ^e	Sch. 160 or XS or 0.5 in. (12.7 mm)
16	Valve datasheet identification code when provided by the purchaser	— ^e	As per purchaser requirements

Add new Footnote ^h

^h Shall be on either the body weld ends or the nameplate, at a minimum. May be on both.

Add new Footnote ⁱ

ⁱ When QSL2G, QSL2.1 or QSL2.1G is specified, "QSL2" shall be marked on the nameplate.

Add to section

Nameplate marking shall be die-stamped, or laser engraved with readable indications.

Multiple nameplates shall be used if needed to guarantee legibility of the information.

The nameplate shall contain USC and SI (metric) units.

The nameplate rivet holes shall be pre-drilled prior to the body hydrotest.

The nameplate shall be attached on completion of the coating.

13 Draining, Protection, and Preparation for Transport

Replace section 13.1 title with

13.1 Draining and Cleaning

Add to section

Valves shall be cleaned internally and be free of particles and organic substances.

13.2 Protection

In list item e), add after "cover/plug"

made from wood with moisture barrier or rigid plastic

Add to section

Wooden protective covers shall be attached to the valve ends using bolting and nuts.

Plastic protective covers with integral moulded securing plugs shall be secured in bolt holes.

Unpainted surfaces shall be protected from atmospheric corrosion during shipping and storage.

Preservation shall be by corrosion preventative fluids.

Corrosion preventative fluids used for valve preservation shall not be detrimental to nonmetallic parts.

Machined and threaded surfaces made of non-corrosion-resistant materials shall be coated with a rust-preventative compound.

The rust-preventative compound shall be removable without mechanical means.

When the rust-preventive compound is not compatible with the specified service, the rust prevention method shall comply with the specified cleanliness requirements.

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

Vapor phase corrosion inhibitors (VPCIs) shall be applied to the valve packaging in accordance with the VPCI manufacturer's instructions.

Auxiliary connections shall be protected from mechanical damage during transportation.

Auxiliary connections shall be protected from ingress of water and foreign material.

13.3 Preparation for Transport

Add to section

Plug and protective cover design shall prevent ingress of water and foreign material into the valve during shipping and outdoor storage.

Valves with a calculated weight of more than 2200 lbs (1000 kg) excluding packaging shall be weighed.

For identical valves with a calculated weight of more than 2200 lbs (1000 kg), only a single valve shall require weighing.

14 Documentation

14.1 Minimum Documentation and Retention

In first paragraph, replace "a minimum of 10 years following the date of manufacture" with

15 years following the date of manufacture or, when specified, 10 years following the commencement of the contract guarantee period

Add new list items

- cross-section drawings with parts and materials list;
- general arrangement drawings;
- manufacturing, testing and inspection procedures;
- nonconformance records;
- authorized concessions, waivers and/or material substitutions;
- applicable manuals (e.g., assembly or maintenance manuals);
- weld maps of major repairs;
- heat treatment records, including heat treatment charts.

14.2 Documentation Provided with the Valve

14.2.1 General

Add new list items

- handling, shipping, storage and preservation procedure;
- manufacturer's release note;
- agreed deviations (where applicable for receipt control).

Add to section

The documentation provided with the valve shall be attached to the valve or the shipping container in a sealed waterproof envelope.

Annex H **(normative)**

Heat-treat Equipment Qualification

Add new section H.0 before H.1

H.0 General

Heat-treatment facilities shall comply with the applicable MDSs in IOGP S-563.

Annex I

(normative)

Quality Specification Level (QSL) and Supplemental Testing

I.1 General

In first paragraph, replace "QSL2, QSL3, QSL3G, QSL4, or QSL4G" with

QSL2, QSL2G, QSL2.1, QSL2.1G, QSL3, QSL3G, QSL4, or QSL4G

In NOTE, replace "QSL numbers 2, 3, 3G, 4, and 4G" with

QSL numbers 2, 2G, 2.1, 2.1G, 3, 3G, 4, and 4G

I.2 NDE Requirements for Quality Specification Levels

In first paragraph, replace "QSL2, QSL3/3G, and QSL4/4G" with

QSL2/2G, QSL2.1/2.1G, QSL3/3G, and QSL4/4G

Add after NOTE 3

Certification shall be performed by an independent third-party certification body or authorized qualifying body in accordance with the ASNT Central Certification Program (ACCP) or ISO 9712.

Table I.1—NDE Requirements*Replace Table I.1 with*

Part	QSL2/2G		QSL2.1/QSL2.1G/QSL3/3G		QSL4/4G	
	Cast	Wrought ^g	Cast	Wrought ^g	Cast	Wrought ^g
Body, end connectors, bonnet, cover, gland housing ^f and integral lifting lugs	VT1 and VT5	VT2 and VT5	VT1 and VT5	VT2 and VT5	VT1 and VT5	VT2 and VT5
	MT2 or PT2	MT1 or PT1	MT2 or PT2	MT1 or PT1	MT2 or PT2	MT1 or PT1
	RT1 ^{a, i}	-	RT1 ^a	UT2	RT3 ^a	UT2
Weld ends ^{b, f}	VT1 and VT5	VT2 and VT5	VT1 and VT5	VT2 and VT5	VT1 and VT5	VT2 and VT5
	MT2 or PT2	MT1 or PT1	MT2 or PT2	MT1 or PT1	MT2 or PT2	MT1 or PT1
	RT3 or UT4	UT2	RT3 or UT4	UT2	RT3 or UT4	UT2
Stem or shaft ^c	N/A	VT5	N/A	VT5	N/A	VT5
		MT1 or PT1		MT1 or PT1		MT1 or PT1
		-		-		UT2
Trunnion ^d and trunnion/bearing plates	VT1 and VT5	VT2 and VT5	VT1 and VT5	VT2 and VT5	VT1 and VT5	VT2 and VT5
	-	-	MT2 or PT2	MT1 or PT1	MT2 or PT2	MT1 or PT1
	-	-	-	-	UT1	UT2
Pressure-boundary bolting	N/A	VT4 ^k	N/A	VT4 ^k	N/A	VT4 ^k
		-		Table I.3		Table I.3
Ball ^c and seat rings ^c	VT1 and VT5	VT2 and VT5	VT1 and VT5	VT2 and VT5	VT1 and VT5	VT2 and VT5
	-	-	MT2 or PT2	MT1 or PT1	MT2 or PT2	MT1 or PT1
Corrosion-resistant overlay in final supplied condition	VT3					
	PT1					
	-	-	UT3 ^h	UT3 ^h	UT3	UT3
Welds ^e to pressure-containing parts	VT3					
	MT1 or PT1					
Hard facing	VT4					
	PT1					
Sealing surfaces	VT5					
	MT3 or PT3					
Seals gaskets and seat springs	VT4					
Pressure-containing welds (except seal welds)	VT3					
	MT1 or PT1					
	RT2 ^j					
Plating	VT4					

Table I.1 (continued)

Part	QSL2/2G		QSL2.1/QSL2.1G/QSL3/3G		QSL4/4G	
	Cast	Wrought ^g	Cast	Wrought ^g	Cast	Wrought ^g
Key N/A The manufacturer is not allowed to use this material form for this specific part. NOTE See Table I.2 for the specification of the examinations referred to in this table. ^a RT1 and RT3 may be replaced by UT4 by agreement. ^b A band around each weld end extending back from the body end a distance equal to the greater of 3 times the wall thickness (t_m) or 2.75 in. (70 mm). See ASME B16.34 for definition of "wall thickness (t_m)". ^c MT or PT to be performed prior to coating, plating or overlay. ^d Trunnion designs may be pressure-containing or pressure-controlling. If the trunnion is a pressure-containing part, the requirements for body apply. ^e These include seal, fillet, attachment, reinforcing, stiffening welds, etc. ^f RT1 plus UT1 may be replaced by RT3. ^g Wrought material applies to bar, forgings and plate. ^h Machined surfaces only. ⁱ 5 % or minimum QSL2, one part per component batch to be examined. If defects outside acceptance criteria are detected, two or more parts shall be tested, and if any of these two fails, all items represented shall be examined. ^j Where RT2 is not possible, UT3 shall be performed. ^k VT examination shall cover all areas of threads, shanks and heads. Discontinuities shall comply with the requirements specified in ASTM F788 for bolts/studs and ASTM F812 for nuts.						

Table I.2—Extent, Method, and Acceptance Criteria of NDE/Item Examination Code*Replace Table I.2 with*

Exam	API 6D 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:2025, Article 2	ASME BPVC, Section VIII, Division 1:2025, Appendix 7
RT2	100 % where practicable	ASME BPVC, Section V:2025, Article 2	ASME BPVC, Section VIII, Division 1:2025, UW-51 for linear indications and ASME BPVC, Section VIII, Division 1:2025, Appendix 4 for rounded indications
RT3	100 %	ASME BPVC, Section V:2025, Article 2	ASME BPVC, Section VIII, Division 1:2025, Appendix 7
UT1	Remaining areas not covered by RT1	ASME BPVC, Section V:2025, Article 5	ASTM A609/A609M:2018, Table 2, Quality Level 2
UT2	All surfaces	ASME BPVC, Section V:2025, Article 5	Forgings: ASME BPVC, Section VIII, Division 1:2025, UF-55 for angle beam and ASME B16.34 for straight beam Plate: ASTM A578/A578M
UT3	Weldments: all surfaces	ASME BPVC, Section V:2025, Article 4	ASME BPVC, Section VIII, Division 1:2025, Appendix 12
	Overlay: all accessible machined surfaces	ASME BPVC, Section V:2025, Article 4 straight beam method	ASTM A578A/A578M:2023, standard Level C
UT4	100 %	ASME BPVC, Section V:2025, Article 5	ASTM A609/A609M:2018, Table 2, Quality Level 1
MT1	All accessible surfaces	ASME BPVC, Section V:2025, Article 7	ASME BPVC, Section VIII, Division 1:2025, Appendix 6
MT2	All accessible surfaces	ASME BPVC, Section V:2025, Article 7	ASME BPVC, Section VIII, Division 1:2025, Appendix 7
MT3	All sealing surfaces	ASME BPVC, Section V:2025, Article 7	No rounded or linear indications in pressure-contact sealing surfaces shall be permitted. Re-examination of questionable indications per ASME BPVC, Section VIII, Division 1:2025, Appendix 6-3 (c) is acceptable.
PT1	All accessible surfaces	ASME BPVC, Section V:2025, Article 6	ASME BPVC, Section VIII, Division 1:2025, Appendix 8
PT2	All accessible surfaces	ASME BPVC, Section V:2025, Article 6	ASME BPVC, Section VIII, Division 1:2025, Appendix 7
PT3	All sealing surfaces	ASME BPVC, Section V:2025, Article 6	No rounded or linear indications in pressure-contact sealing surfaces permitted. Re-examination of questionable indications per ASME BPVC, Section VIII, Division 1:2025, Appendix 8-3 (c) is acceptable.

Table I.2 (continued)

Exam	API 6D Extent	Method	Acceptance
VT1	100 % accessible as cast surfaces	9.4.2	9.4.2
VT2	100 % accessible as forged surfaces	9.4.3	9.4.3
VT3	Weldments: 100 % accessible as welded surfaces	7.8 or 7.9	7.8 or 7.9
	Overlay: as per applicable EDS. If no EDS, refer to 7.5.3.2.	As per applicable EDS. If no EDS, refer to 7.5.3.2.	As per applicable EDS. If no EDS, refer to 7.5.3.2.
VT4 ^b	100 % accessible surfaces	As per manufacturer's requirements and as per applicable EDS	As per manufacturer's requirements and as per applicable EDS
VT5	100 % accessible machined surfaces	9.4.4	9.4.4
^a A relevant indication is defined as a surface NDE indication with major dimensions greater than $\frac{1}{16}$ in. (1.6 mm). An indication not associated with a surface rupture is not considered to be a relevant indication. ^b Visual inspection of gaskets shall ensure the item is free from sharp edges, burrs, organic substances or foreign particulate matter.			

I.4 Testing Requirements

In first paragraph, replace "QSL2, QSL3, QSL3G, QSL4, or QSL4G" with

QSL2, QSL2G, QSL2.1, QSL2.1G, QSL3, QSL3G, QSL4, or QSL4G

Table I.4—FAT Requirements for Quality Specification Levels (QSLs)*Replace Table I.4 with*

Sequence	Test Activity	Quality Specification Levels (QSLs)							
		QSL2	QSL2G	QSL2.1	QSL2.1G	QSL3 ^{a, b}	QSL3G ^{a, b}	QSL4 ^{a, b, c}	QSL4G ^{a, b, c}
1 ^g	Antistatic testing as per L.5	One valve of each unique design/size/rating/material	One valve of each unique design/size/rating/material	All	All	All	All	All	All
2	Hydrostatic shell test as per 10.3 or I.5	One test	One test	One test	One test	Two tests	Two tests	Three tests	Three tests
3	Torque or thrust test as per I.6	Only for bare stem valves and bare stem valves to be fitted with actuators	Only for bare stem valves and bare stem valves to be fitted with actuators	All	All	All	All	All	All
4	Functional test as per I.6.1 with lever/ gearbox fitted excluding bare stem valves at 1.0 times the rated pressure	All	All	All	All	All	All	All	All
5	Hydrostatic seat test as per 10.4 or I.5	One test	N/R ^d	One test	N/R ^d	Two tests	N/R ^d	Three tests	N/R ^d
6	Seat cavity relief test using water as per I.7	One valve per lot ^e	One valve per lot ^e	All	N/R	All	All	All	All
7	High-pressure gas shell test as per I.8.2	N/R	One test	N/R	One test	N/R	Two tests	N/R	Three tests
8	Low-pressure gas seat test as per I.9.1	N/R	N/R	N/R	All	N/R	All	All	All
9	High-pressure gas seat test as per I.8.3	N/R	One test	N/R	One test	N/R	Two tests	N/R	Three tests

Table I.4 (continued)

Sequence	Test Activity	Quality Specification Levels (QSLs)							
		QSL2	QSL2G	QSL2.1	QSL2.1G	QSL3 ^{a, b}	QSL3G ^{a, b}	QSL4 ^{a, b, c}	QSL4G ^{a, b, c}
10	Testing as per 10.4.4 when DBB/DIB functionality is specified	All	All	All	All	All	All	All	All
11	Seat cavity relief test using inert gas as per I.7	N/R	One valve per lot ^e	N/R	All	N/R	All	N/R	All
12	Low-pressure gas seat test as per I.9.1	One test	One test	One test	One test	Two tests	Two tests	Three tests	Three tests
13	Low-pressure gas shell test at 80 psi (6 bar) to 100 psi (7 bar)	For threaded plug or flange connections	For threaded plug or flange connections	For threaded plug or flange connections	For threaded plug or flange connections	For threaded plug or flange connections	For threaded plug or flange connections	For threaded plug or flange connections	For threaded plug or flange connections
14	High-pressure gas shell test as per I.8.2	None except for seal welded plug. One test	None except for seal welded plug. One test	None except for seal welded plug. One test	None except for seal welded plug. One test	None except for seal welded plug. One test	None except for seal welded plug. One test	None except for seal welded plug. One test	None except for seal welded plug. One test
15 ^f	Sample fugitive emission testing as per L.24.2	When specified	When specified	When specified	When specified	When specified	When specified	When specified	When specified
Key N/R = not required ^a For all QSL3, QSL3G, QSL4, and QSL4G shell tests: After each test, the pressure shall be reduced to zero. ^b For all QSL3, QSL3G, QSL4, and QSL4G seat tests: After each test, the pressure shall be reduced to zero and the valve closure member shall be moved off the seat and returned. ^c For all QSL4 and QSL4G tests, the second pressure test shall have an extended duration of four times (4x). ^d As per the manufacturer's requirement, a hydrostatic seat test as per 10.4 may be performed. ^e One lot refers to valves of the same purchase order and design, manufactured in the same manufacturing location. ^f Sequence 15 related to sample fugitive emission testing may be combined with sequence 14. In this case, the fugitive emission test pressure is increased to 1.1 rated pressure. ^g For valves that are already in stock and that do not have any antistatic test documentation, the antistatic test may be done later.									

Add to section

The QSL2 valve tests listed in Table I.4 shall be subjected to end load tests in accordance with Table 22.

When QSL2G, QSL2.1, QSL2.1G, QSL3 or QSL3G is specified, where Table 22 specifies one valve per batch, 10 % of valves shall be tested with end load.

When QSL4 or QSL4G is specified, where Table 22 specifies one valve per batch, all valves shall be tested with end load.

I.6 Torque/Thrust Functional Testing

I.6.1 Method

Replace section with

Functional testing and/or torque testing shall be performed for the following valve operations:

- a) closed-to-open and open-to-closed without pressure;
- b) closed-to-open with one side of the ball pressurized, and the cavity and opposite side at atmospheric pressure;
- c) repeat step b) but with the other side of the ball pressurized, and the cavity and opposite side at atmospheric pressure;
- d) open-to-closed with the bore pressurized and the cavity at atmospheric pressure, if applicable to the valve design;
- e) closed-to-open with both sides of the ball pressurized and the cavity at atmospheric pressure.
- f) for DIB-1 and DIB-2 valves, closed-to-open with simultaneously one side of the ball and the cavity pressurized, and opposite side at atmospheric pressure;
- g) for DIB-1 valves, repeat step f) but with simultaneously the other side of the ball and the cavity pressurized, and opposite side at atmospheric pressure;
- h) for DIB-1 valves, closed-to-open with the cavity pressurized and both ends of the valve at atmospheric pressure;
- i) for DIB-1 valves, open-to-closed with the cavity pressurized and the bore at atmospheric pressure.

The valve shall be fully opened for the opening operations and fully closed for the closing operations.

Functional testing shall be performed at the pressure rating in accordance with 4.3 for the material at 100 °F (38 °C).

When one side of the ball is pressurized, the body cavity and opposite side of the ball shall be kept at atmospheric pressure.

When opening the valve, one side of the ball is pressurized while the body cavity and opposite side of the ball shall be at atmospheric pressure.

When both sides of the ball are pressurized, the body cavity shall be kept at atmospheric pressure.

When opening the valve, both sides of the ball are pressurized while the body cavity shall be at atmospheric pressure.

Where applicable to the valve design, when the valve bore is pressurized, the body cavity shall be kept at atmospheric pressure.

Where applicable to the valve design, when opening the valve, the valve bore is pressurized while the body cavity shall be at atmospheric pressure.

NOTE 2 When the valve bore is pressurized, keeping the body cavity at atmospheric pressure is not required for valves with a pressure balancing hole.

For the functional testing, the operating torque shall be measured at each step detailed in I.6.1, a) through e) with the operator installed.

When performing torque measurements (during torque testing and functional testing steps), the highest value shall be recorded for each of the steps detailed in I.6.1, a) through e).

When performing I.6.1 b), c), d) and e) operations, the valve shall be operated after a minimum of 1 minute of maintaining the test pressure.

When performing I.6.1 b), c), d) and e) operations, torque measurement shall be performed up to decompression of the pressurized volume.

Torque testing and functional testing shall be performed with the seats free of sealant.

NOTE 3 If necessary for assembly, a lubricant with a viscosity not exceeding that of SAE 10W motor oil may be used.

I.6.3 Acceptance Criteria

Replace section with

I.6.3.1 Acceptance Criteria for Torque Testing

The measured torque results shall be less than or equal to the manufacturer's documented valve torques.

The measured operating torque shall not exceed the design torque (see to 5.3.2).

I.6.3.2 Acceptance Criteria for Functional Testing

Manual valves shall demonstrate smooth operability.

The measured operating torque shall not exceed the design torque (see to 5.3.2).

The measured operating torque results for valves with a manual gearbox shall be less than or equal to the manufacturer's documented valve torques.

The measured/calculated force required at the perimeter of the hand-wheel or wrench (lever) for manual valves shall not exceed the lower of 80 lbf (360 N) (see 5.4.2.1) or the manufacturer's documented operating forces.

The gearbox output torques for valves with a manual gearbox shall be calculated using the gearbox mechanical advantage ratio.

The calculated gearbox output torques shall be compared and correlated to the valve torques.

I.6.3.3 Acceptance Criteria Results

The measured/calculated torques and forces shall be recorded.

I.7 Cavity Relief Testing

I.7.1 General

Add to section

When specified, cavity relief testing described in I.7.2. shall be performed with a test fluid of inert gas.

I.7.2 Trunnion-mounted Ball Valves

I.7.2.1 Procedure 1—Self-relieving Seats

Replace third paragraph

The valve cavity relief pressure shall not exceed the lower of 33 % of the valve pressure rating or 435 psig (30 bar).

In EXAMPLE 2, replace "2060 psi (142.1 bar)" with

435 psig (30 bar)

I.8 High-pressure Gas Testing

I.8.1 Valve Preparation for Testing

Add to section

The valve shall be isolated from the supply pressure source with the volume beyond the pressurized seat being at atmospheric pressure.

Following pressurization and prior to measurement of seat leakage commencing, the valve shall be fully stabilized.

The valve stabilization period shall begin when the test pressure in the valve has remained constant for at least 2 minutes.

I.8.2 High-pressure Gas Shell Test

I.8.2.1 Method

Replace second list section with

- Method 2: Valves shall have a high-pressure gas shell test performed using a helium gas with a minimum purity of 97 % by volume and a helium leak detector fitted with a detector probe (sniffer).

Add to section

Valves NPS 24 and smaller shall be tested with Method 1.

Drains, vents, sealant injection internal non-return valves, additional connections and blind flanges that form part of the final assembly shall be installed prior to the start of the high-pressure gas shell test.

Injection fittings shall be installed upon completion of the pressure testing requirements.

Dismantling of body connections (e.g., vent and drain plugs) after the initial gas shell test shall require that an additional gas shell test is performed, when body connections have been re-installed.

I.8.2.2 Acceptance Criteria

Replace second list section and EXAMPLE with

- Method 2: When using a helium leak detector fitted with a detector probe (sniffer), a maximum leakage of 200 ppmv shall be permitted when measured at each mechanical joint.

I.8.3 High-pressure Gas Seat Test

I.8.3.1 Method

Add after first paragraph

The stabilization period duration shall not be less than duration specified in Table L.1.

During the stabilization period, the outlet port where leakage is to be measured from shall remain connected to the leakage detection source (e.g., flow meter or water-filled bubble counter vessel).

During the stabilization period, the outlet port shall be monitored.

Add to section

The valve shall be isolated from the supply pressure source with the volume beyond the pressurized seat being at atmospheric pressure.

Seat leakage shall be monitored from the downstream side of the seat (i.e., via the valve body cavity) when under high-pressure gas seat test.

The volume on the valve end of the non-tested seat shall be isolated, if not used for measuring leakage.

Body connections not used for leakage detection shall be isolated during the high-pressure gas test.

I.9 Low-pressure Gas Seat Testing

I.9.1 Low-pressure Gas Seat Testing—Type II

Add after second sentence

Following pressurization and prior to commencing seat leakage measurement, the pressure shall be fully stabilized.

Replace third sentence with

Pressure shall be identified as stabilized when the valve pressure remains constant for at least 2 minutes.

The seat to ball contacts and leakage connection port shall be free of visible fluids prior to the start of the low-pressure gas seat test.

Add to section

During the stabilization period, the outlet port where leakage is to be measured from shall remain connected to the leakage detection source (e.g., flow meter or water-filled bubble counter vessel).

During the stabilization period, the outlet port shall be monitored for the duration.

The stabilization period duration shall not be less than shown in Table L.1.

NOTE See K.30 for optional stabilization period duration.

The stabilization duration shall be extended if stabilization is not achieved.

Following stabilization, the seat leakage test shall begin.

The test duration shall be in accordance with Table 10.

I.9.2 Acceptance Criteria

Replace section with

The acceptable leakage rate for the low-pressure gas seat test shall be in accordance with Table 21.

I.10 Documentation

Replace "QSL2" with

QSL2/2G, QSL2.1/2.1G,

Table I.6—Documentation Requirements for Each QSL

Delete third column "QSL2", fourth column "QSL3/3G", fifth column "QSL4/4G" and footnotes

Add rows "Item 11" to "Item 20"

Item	Documentation
11	Design documentation
12	Weld procedure specification (WPS)
13	Weld procedure qualification record (PQR)
14	Visual inspection records
15	Chloride content in the hydrostatic test water (see 10.1.3)
16	Valve assembly serial number traceable to the following information:
17	Manufacturing, testing and inspection procedures
18	Nonconformance records
19	Authorized concessions, waivers and/or material substitutions
20	Weld maps of major repairs

Annex K

(normative)

Purchaser-specified Customization—Permissible Deviations to Specified Design and Manufacturing Requirements

Add new section

K.16 Specific Valve Orientation

When valve orientation is specified, the valve shall function in the specified orientation and in the stem-upright position.

Add new section

K.17 Permitted Use of Cap Screws

When specified, cap screws shall be permitted for pressure-containing bolting.

Add new section

K.18 Alternative Bolt Sizes

When specified, bolted joint designs with bolt size below the minimum size specified in 5.1.4 shall be permitted.

Add new section

K.19 Vent and Drain Ports of Corrosion-resistant Alloy (CRA) Clad Valves

When specified, vent and drain ports of CRA clad valve designs not in accordance with 5.6.1.1 shall be permitted.

Add new section

K.20 Alternative Stem/Shaft Injection Point Arrangements

When specified, one non-return valve for stem injection points shall be permitted.

When specified, ball and spring materials for non-return valves that do not conform to 5.6.2 shall be permitted.

Add new section

K.21 Standard Bore with Smooth Transition for Piggable Valves

When piggability is specified, a bore that is different from the specified internal pipeline diameter bore shall be permitted with prior acceptance.

When an alternative bore is accepted, the bore shall have a smooth transition at the valve end.

Add new section

K.22 Use of Elastomeric O-rings at Temperatures Below –20 °F (–29 °C).

When specified, elastomeric O-rings shall be acceptable for use at temperatures below –20 °F (–29 °C) when qualified in accordance with purchaser requirements.

Add new section**K.23 RGD Resistant Elastomer O-ring Section Greater Than 0.275 in. (6.99 mm)**

When specified, RGD resistant elastomer O-ring section greater than 0.275 in. (6.99 mm), shall be permitted.

Add new section**K.24 Elastomer Qualification of Resistance to RGD at Alternate Pressure**

When specified, elastomer qualification for resistance to RGD shall be at the pressure as per the purchaser-agreed specification.

EXAMPLE If ISO 23936 is the purchaser-agreed specification, the purchaser could opt to test at a pressure of 15 MPa.

Add new section**K.25 Fire Testing Option**

When specified, valves not qualified by fire testing shall be permitted.

Add new section**K.26 Alternate Drain/Vent Auxiliary Blind Flange Materials for Carbon Steel Valves**

When specified, alternate drain/vent auxiliary blind flange materials for carbon steel valves shall be permitted.

Add new section**K.27 Acceptable Material Combinations Other Than IOGP S-562 Material Classes**

When specified, materials for valve components from material combinations not listed in Annex N shall be permitted.

Add new section**K.28 Alternate Seat Test Acceptance Criteria**

When specified for metal-seated valves, acceptance criteria for seat leakage rates for hydrostatic seat tests and low-pressure gas seat tests shall conform to Table K.1.

Add new Table K.1**Table K.1—Alternative Metal-seated Valve Seat Test Acceptance Criteria For Leakage**

Hydrostatic Seat Test	Low-pressure Gas Seat Test
Maximum Leak Rate ^{a, b, c}	Maximum Leak Rate ^{a, c}
C	2 X C
^a The acceptance criteria is applicable to seat testing when pressure is applied from one valve end only and also to DIB testing when pressure is applied from one valve end and the cavity. ^b The acceptance criteria applicable to DBB testing when pressure is applied from both ends simultaneously shall be double the listed values. ^c Leakage rates as per ISO 5208.	

Add new section

K.29 Alternate Quantities of Weld End Valves Per Batch, Tested With End Load

When specified, quantities of weld end valves per batch, tested with end load that do not conform to Table 22, shall be permitted.

Add new section

K.30 Stabilization Period for Type II Low-Pressure Gas Testing

When specified, the stabilization period duration for Type II low-pressure gas testing that does not conform to Table L.1 shall be permitted.

Annex L (informative)

Specified Customization—Supplemental Options to Specified Design and Manufacturing Requirements

L.9 Double Block and Bleed (DBB) Valves

Add new list section after fourth list section

- The seat test duration shall conform to Table 10.

Replace fifth list section with

- Acceptance criteria for seat leakage rates shall be in accordance with Table 21.

Add to section

The valve shall be isolated from the supply pressure source with the volume beyond the pressurized seat being at atmospheric pressure.

When QSL2G, QSL2.1G, QSL3G or QSL4G is specified, the test fluid shall be inert gas.

When testing with gas, the valve shall be drained of the hydrostatic test fluid prior to the start of the testing.

The inner parts of the valve shall be purged with air prior to the start of the high-pressure gas testing.

When testing with gas, the pressure shall be stabilized in accordance with Table L.1 prior to the start of pressure testing.

When testing with gas, acceptance criteria for soft-seated valves shall be in accordance with the requirements of I.8.3.2.

When testing with gas, the leakage rate for metal-seated valves shall not be more than four times ISO 5208, Rate C.

L.10 Double Isolation and Bleed DIB-1 (Both Seats Bidirectional)

Add new list sections after fourth list section

- The valve shall be isolated from the supply pressure source with the volume beyond the pressurized seat being at atmospheric pressure.
- If the volume at the opposite side of the tested seat is not measuring leakage, the volume shall be isolated.
- The seat test duration shall be in accordance with Table 10.
- No draining shall be allowed from the valve body cavity or from the downstream side of the valve during the hydrostatic seat test.

Add new list section after fifth list section

- The cavity and the valve shall be filled with the test fluid, with the valve unseated and partially open, until the test fluid overflows through each valve end connector.

Replace last list section with

- Acceptance criteria for the hydrostatic seat test shall be in accordance with the requirements of 10.4.1.

Add to section

When QSL2G, QSL2.1G, QSL3G or QSL4G is specified, the test fluid shall be inert gas.

When testing with gas, the valve shall be drained of the hydrostatic test fluid prior to the start of the testing.

The inner parts of the valve shall be purged with air prior to the start of the high-pressure gas testing.

When testing with gas, prior to the start of pressure testing, the pressure shall be stabilized in accordance with Table L.1.

Pressure shall be declared stabilized when the valve pressure remains constant for at least 2 minutes.

When testing with gas, acceptance criteria shall be in accordance with the requirements of I.8.3.2.

L.11 Double Isolation and Bleed DIB-2 (One Unidirectional and One Bidirectional Seat)

Add new list sections after fourth list section

- The valve shall be isolated from the supply pressure source with the volume beyond the pressurized seat being at atmospheric pressure.
- If the volume at the opposite side of the tested seat is not measuring leakage, the volume shall be isolated.
- Seat test duration shall be in accordance with Table 10.
- No draining shall be allowed from the valve body cavity or from the downstream side of the valve during the hydrostatic seat test.

Replace last list item with

- Acceptance criteria for the hydrostatic seat test shall be in accordance with Table 21.

Add to section

When QSL2G, QSL2.1G, QSL3G or QSL4G is specified, the test fluid shall be inert gas.

When testing with gas, the valve shall be drained of the hydrostatic test fluid prior to the start of the testing.

The inner parts of the valve shall be purged with air prior to the start of the high-pressure gas testing.

When testing with gas, prior to the start of pressure testing, the pressure shall be stabilized in accordance with Table L.1.

Pressure shall be declared stabilized when the valve pressure remains constant for at least 2 minutes.

When testing with gas, acceptance criteria shall be in accordance with the requirements of I.8.3.2.

L.12 Operations Testing—Valves Required for Double Isolation and Bleed (DIB-1 or DIB-2)

Add new list sections a-i) to a-x) after list section a)

- a-i) When QSL2G, QSL2.1G, QSL3G or QSL4G is specified, the test fluid shall be inert gas.

- a-ii) When testing with gas, the valve shall be drained of the hydrostatic test fluid prior to the start of testing.
- a-iii) The inner parts of the valve shall be purged with air prior to the start of the high-pressure gas testing.
- a-iv) The seat test duration shall be in accordance with Table 10 for hydrostatic testing.
- a-v) When testing with gas, prior to the start of pressure testing, the pressure shall be stabilized in accordance with Table L.1.
- a-vi) Pressure shall be identified as stabilized when the valve pressure remains constant for at least 2 minutes.
- a-vii) The seat test duration shall be in accordance with Table I.5 for gas testing.
- a-viii) Hold periods shall start when pressure stabilization has been achieved.
- a-ix) No draining shall be allowed from the valve body cavity or from the downstream side of the valve during the hydrostatic seat test.
- a-x) The cavity shall be isolated (closed) from the atmospheric pressure or pressure source prior to monitor leakage.

In step 3) of list section b), add after "Reduce pressure"

, in 25 % increments,

Add new steps 3-i) to 3-iii) after step 3) of list section b)

- 3-i) Stabilize pressure at every reduction increment.
- 3-ii) Pressure shall be restored if pressure drops below MAWP on the upstream side and the cavity.
- 3-iii) Isolate the valve from the supply pressure source with the volume beyond the pressurized seat being at atmospheric pressure.

Add new step 5-i) after step 5) of list section b)

- 5-i) Stabilize pressure.

Replace step 6) of list section b) with

- 6) Reintroduce pressure into the cavity, in 14.5 psig (1 barg) increments, up to 145 psi (10 bar) and monitor leakage, after stabilization, to the downstream side.

Add new steps 6-i) and 6-ii) after step 6) of list section b)

- 6-i) While upstream and cavity pressures are maintained, increase pressure into the cavity, in 145 psig (10 barg) increments, up to MAWP.
- 6-ii) Monitor leakage to the downstream side and the upstream pressure, after stabilization.

In step 7) of list section b), add after "Reduce pressure"

, in 25 % increments,

Replace list section d) with

- d) Acceptance criteria for the hydrostatic seat test and the low-pressure gas seat test shall be in accordance with the requirements of 10.4.1.

Add new list section e)

- e) Acceptance criteria for high-pressure gas testing shall be in accordance with the requirements of I.8.3.2.

L.14 Drive Train Strength Test

Add new list item after first list item

- the maximum specified operator output torque; or

Add after NOTE

The drive train strength test shall be performed by blocking movement of the valve from its fully open position (e.g., by inserting a test mandrel into the valve).

A single valve shall qualify identical valves in the order.

The test mandrel shall be manufactured from a softer material than the valve components in contact with the test mandrel.

The test plug shall be cylindrical and within $1/16$ in. (1.5 mm) of the bore diameter, to prevent damage of internal valve parts.

Prior to start the drive train strength test, interfaces between body, body cover, bonnet, bonnet cover, adapting flanges, mounting kit, extension casing and operator shall be marked with a paint pen.

On completion of the test, misalignment between marked parts shall not be allowed.

L.19 Low-pressure Gas Seat Testing

L.19.1 Low-pressure Gas Seat Testing—Type I

L.19.1.2 Acceptance Criteria

In second list item, replace "two times Rate C" with

Rate B

L.19.2 Low Pressure Gas Seat Testing—Type II

Replace section with

When specified, low-pressure gas seat testing Type II shall be performed as per I.9.

L.20 High-pressure Gas Testing

Replace section with

When specified, high-pressure gas testing shall be performed as per I.8.

L.22 Disassembly/Maintenance Tools

In first paragraph, add after "inform the purchaser"

, prior to order,

L.24 Fugitive Emissions

L.24.1 Valve Qualification Testing

Add to section

When qualification testing is in accordance with ISO 15848-1, the fugitive emission tightness class and the endurance class shall be specified.

The test temperature shall qualify valve designs for the specified minimum and maximum allowable temperatures.

When performing a new qualification, test equipment shall have a valid calibration certificate and a valid calibration date not exceeding 6 months.

When performing a new qualification, personnel performing fugitive emission testing shall be qualified in accordance with the manufacturer's documented training program.

NOTE 2 As fugitive emission tightness is adversely affected when the stem is in the horizontal position, it is considered conservative and advantageous to test the valve in such orientation, as such qualification will cover any other installation orientation. API 624 requires testing with the stem in the vertical position, and this is a limitation when choosing API 624 for new qualifications.

Fugitive emission testing shall be in accordance with Level 1 requirements specified in ISO 9712 or ASNT SNT-TC-1A for the tracer gas method.

When performing a new qualification in accordance with ISO 15848-1, if the valve installation orientation is not specified, the valve shall be tested with the stem or shaft in horizontal position.

Previous ISO 15848-1 qualification testing with the stem or shaft in vertical position shall require purchaser acceptance.

Leakage measurement from the stem/shaft seal and from the body seals shall cover all potential leak paths (e.g., drain, vent, body joint and bolting connections).

L.24.2 Valve Production Testing

Add to section

The fugitive emission tightness class shall be specified.

The valve shall be tested in the specified installation orientation.

If the valve installation orientation is not specified, the valve shall be tested with the stem or shaft in horizontal position.

The measurement shall commence after the test pressure has been applied for 10 minutes.

Personnel performing emission testing shall be qualified in accordance with the manufacturer's documented training program.

Fugitive emission testing shall be in accordance with Level 1 requirements specified in ISO 9712 or ASNT SNT-TC-1A for the tracer gas method.

Leakage measurement from the stem (or shaft) seal and from the body seals shall cover all potential leak paths (e.g., drain, vent, body joint and bolting connections).

NOTE 2 Sealing design, material and valve manufacturing location are typically considered when selecting the sampling percentage.

If the sample size is not specified, the size shall be determined in accordance with Table L.3.

Add new Table L.3

Table L.3—Sample Strategy for Production Testing

Purchase order quantity per fugitive emission class (X)	Sample size (n) ^a	
	Class AH	Class BH
$X \leq 10$	Minimum 1 or as specified by purchaser	Minimum 1 or as specified by purchaser
$11 \leq X \leq 100$	5 %	3 %
$101 \leq X \leq 1000$	4 %	3 %
$X > 1000$	3 %	2 %
^a 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).		

The samples shall be selected at random from each lot.

The lot shall be accepted when tested valves meet the acceptance criteria.

All valves that are part of the sample shall be tested.

If a valve fails the test, the valve shall be repaired and retested.

If any valve fails the test, a new sample, the same quantity per the original sample, shall be drawn from the failed lot.

If more than one valve fails, the manufacturer shall provide a structured root cause analysis, corrective action and preventative action report.

Valves in a batch with a valve failure shall be subsequently tested in accordance with the accepted corrective action and preventative action report.

When testing with a 10 % He + 90 % N₂ mixture, the measured detector reading shall be multiplied with a factor 10.

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

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

L.26 Locking Provision

Add to section

Manually operated ball valves shall have brackets or locking plates to lock the valve in the open or closed position using padlocks.

NOTE Padlocks provided by others.

The lockable device shall allow a padlock with a $\frac{5}{16}$ in. (8 mm) diameter shank not more than 4 in. (102 mm) long to be inserted directly through the hole(s) in the brackets or locking plates.

L.27 Fire Testing

Add after first paragraph and list items

API 607:1993 qualification shall not be permitted.

NOTE 2 Substitution of a soft-seat for a metal-seat of the same soft sealing configuration may not require requalification.

NOTE 3 Change of nonmetallic materials affects qualification even when the graphitic gasket design is unchanged.

NOTE 4 Qualification scaling criteria will be consistent with the standard used for fire testing.

Fire type-tests shall be witnessed by an independent agency.

A graphitic or metallic sealing barrier shall be installed on each external leakage path.

Graphite seals shall only be acceptable as back-up seals for fire resistance properties.

Graphite back-up seals shall be constructed from a single piece (i.e., not be cut or bonded multi-part).

A modification to the design or material specification of the graphite back-up seals shall require a new qualification.

Add new section

L.30 Lagging Extension Lengths Clearance Required for Insulation

When specified, lagging extension length shall be in accordance with Table L.4.

Lagging extension length shall be measured from the upper bonnet flange to the larger of the end flange rim or body diameter.

NOTE It is expected that the gland will be clear of the lagging to avoid stem leakage entering the lagging. Lagging extensions do not have a vapor space requirement.

Add new Table L.4

Table L.4—Lagging Extension Length Required for Insulation

Valve Size		Lagging Extension Length in. (mm)
NPS	DN	
$\frac{1}{2}$ to 2	15 to 50	2 (50)
3 to 16	80 to 400	3 (75)
18 to 48	450 to 1200	4 (100)

Lagging extended bonnets shall be provided with an insulation collar plate.

The collar plate shall be clamped on the extended bonnet with the bolting on the upper side for adjustment accessibility.

The gap between the bonnet and the collar plate shall be sealed.

The insulation collar shall clear the bonnet lower flange/connection and the valve end flange by a distance in accordance with Table L.5.

Add new Table L.5

Table L.5—Insulation Collar Clearance Required for Insulation

Valve Size		Insulation Collar Clearance in. (mm) tolerance + 0 to + 1.0 in. (+ 0 to + 25 mm)
NPS	DN	
½ to 2	15 to 50	2 (50)
3 to 16	80 to 400	3 (75)
18 to 48	450 to 1200	4 (100)

NOTE The connective heat loss can be reduced by minimizing the diametrical clearance between the stem and the extended bonnet housing.

A stem guide bushing shall be installed at the lower end of the lagging extension bonnet.

When a valve is provided with an extended bonnet, the extended bonnet shall meet the wall thickness requirements of the applicable pressure class of the valve body in accordance with ASME B16.34.

The extended bonnet wall thickness shall account for the pressure stresses, operating torque and bending stresses induced by operation.

Add new section

L.31 Valves Designed to ASME BPVC, Section VIII, Division 2

WARNING—Design per ASME BPVC, Section VIII, Division 2 do not always meet the requirements of ASME B31.3 for listed and unlisted components.

When specified, valves designed to ASME BPVC, Section VIII, Division 2 shall meet the requirements of this section.

Wall thickness calculations of the valve body shall be by finite element analysis in accordance with ASME BPVC, Section VIII, Division 2.

The inner ligaments wall thickness shall prevent permanent deformation or loss of pressure containment due to body dilation in the corroded condition.

If a corrosion allowance is not specified for a valve made of non-corrosion-resistant material, the wall thickness calculation shall be based on a 0.12 in. (3 mm) corrosion allowance.

The thickness of the inner ligaments shall be the calculated thickness of the inner ligaments plus the corrosion allowance.

The wall thickness calculation shall be based on the inside diameter plus twice the specified corrosion allowance.

Bolting design to ASME BPVC, Section VIII, Division 2 rules shall be applied inclusive of bending and axial pipe loads.

The valve design shall incorporate external load cases in accordance with Annex O.

The valve design shall be verified by finite element analysis.

The finite element analysis of the valve shall be in the corroded condition, for consideration of allowable design stresses, deformations and integrity of sealing areas, using the piping loads specified.

The external load analysis of valves shall include the MAWP at ambient and maximum allowable temperatures.

Add new section

L.32 Valves Designed to ASME BPVC, Section VIII Division 2 in compliance with ASME B31.3

When ASME B31.3 is specified and valves are designed to ASME BPVC, Section VIII, Division 2, the requirements of this section shall be followed.

NOTE API 6D valves that are not designed per ASME B16.34 are not recognised by ASME B31.3 as listed components. Valves designed to this section comply with ASME B31.3 requirements for unlisted components.

Valves shall be designed in accordance ASME BPVC, Section VIII, Division 2:2025, Part 5, inclusive of bolting, using the basic allowable stresses from ASME B31.3 (i.e., replacing allowable stress, S , in ASME BPVC, Section VIII, Division 2).

The inner ligaments wall thickness shall prevent permanent deformation or loss of pressure containment due to body dilation in the corroded condition.

If a corrosion allowance is not specified for a valve made of non-corrosion-resistant material, the wall thickness calculation shall be based on a 0.12 in. (3 mm) corrosion allowance.

The thickness of the inner ligaments shall be the calculated thickness of the inner ligaments plus the corrosion allowance.

The wall thickness calculation shall be based on the inside diameter plus twice the specified corrosion allowance.

Bolting design to ASME BPVC, Section VIII, Division 2 rules shall be applied, inclusive of bending and axial pipe loads.

The valve design shall incorporate external load cases in accordance with Annex O.

The valve design shall be verified by finite element analysis.

The finite element analysis of the valve shall be in the corroded condition, for consideration of allowable design stresses, deformations and integrity of sealing areas, using the piping loads specified.

The external load analysis of valves shall include the MAWP at ambient and maximum allowable temperatures.

Add new section

L.33 Pipe Pup/Transition Pieces

When pipe pup/transition piece lengths are not specified, the lengths shall be in accordance with Table L.6.

Add new Table L.6**Table L.6—Pup Lengths**

Valve Size	Pup Length
NPS 2 to NPS 8 (DN 50 to DN 200)	8 in. (200 mm)
NPS 10 to NPS 20 (DN 250 to DN 500)	Minimum 1D or Maximum 20 in. (500 mm)
NPS 22 (DN 550) and above	32 in. (800 mm)
Key D NPS (DN)	

If a pipe pup/transition piece is to be welded to a valve by the manufacturer's sub-contractor, the manufacturer shall submit the qualified welding procedure and procedure qualification record for acceptance.

The pipe pup/transition piece shall be welded and the weld heat-treated if applicable, prior to the installation of valve internals.

Transition tapers shall not be steeper than 1:4.

The ratio of the valve body thickness to the pipe wall thickness shall not exceed 1.5:1.

The ratio of the specified minimum yield strength of the transition piece/pipe pup material to the valve body material or transition piece to the pipe pup shall be less than or equal 1.5 to 1.

Add new section**L.34 Gearbox Protection Class**

When specified, gearboxes shall be provided with a higher degree of protection class than required in 5.4.5.5.

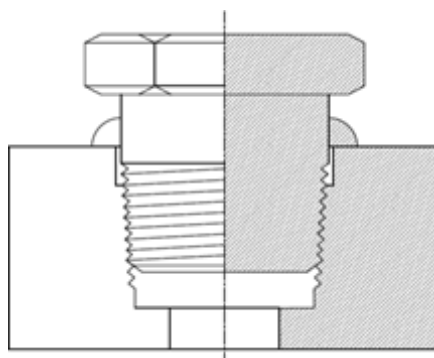
Add new section**L.35 Vent and Drain Connectors**

When specified, drain and vent connections shall be one of the following types:

- NPT standard threaded fitting compatible for seal welding;
- seal welded NPT standard threaded fitting;
- seal welded NPT threaded plug (IOGP design - see Figure L.3);
- double seal (axial outboard and radial inboard) parallel threads with locking ring (see example in Figure L.4);
- studded flange connection (see example in Figure L.5).
- double seal (axial outboard and radial inboard) NPT threads with locking ring in accordance with 5.6.1.4.

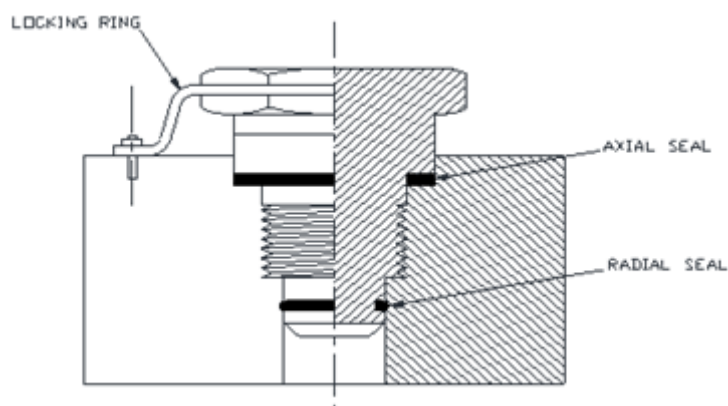
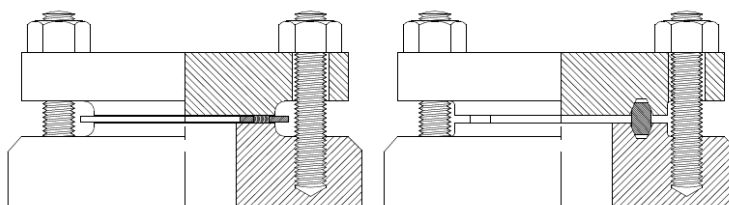
When the seal welded NPT threaded plug (IOGP design) is specified, welding on to threaded areas of welded plugs shall not be permitted.

When tightened, the welded plug thread form of the NPT threaded plug (IOGP design) shall protrude above the first internal thread (see Figure L.3), enabling additional tolerance requirements in accordance with 5.6.1.2.

Add new Figure L.3**1Figure L.3—Seal Welded IOGP Welded NPT Threaded Plug Additional Tolerance Requirements**

The shoulder of the NPT threaded plug (IOGP design) shall extend below the surface of the valve body so that the seal weld does not come into contact with the threads of the NPT fitting.

During loosening of double seal parallel threads, the pressure shall be relieved from the inboard seal without thread disengagement.

Add new Figure L.4**2Figure L.4—Double Seal (Axial Outboard and Radial Inboard) Parallel Threads with Locking Ring**Add new Figure L.5**Figure L.5—Studded Flange Connection**

Add new section

L.36 Alternative Acceptance Criteria for Charpy V-notch Impact Toughness Testing of 20 Cr Group B, 22 Cr, 25 Cr and 27 Cr Materials

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 per ISO 17781 QL I.

Add new section

L.37 ANSI/NACE MR0103/ISO 17945

When specified, metallic materials for use in sour service shall conform to ANSI/NACE MR0103/ISO 17945.

Add new section

L.38 Isolation Valves for Injection Points

When specified, isolating needle valve shall be provided between check valves of seat injection fittings.

NOTE This is typically used for valves equal to or greater than Class 1500 and all valves directly connected to import or export pipelines.

Isolating needle valve for seat injection fittings shall have its outlet adjacent to the injection fitting.

Add new section

L.39 Design Validation of Seat Injection System

When specified, design validation of the seat injection system shall be performed in conformance with the manufacturer's validation procedure.

The sealant or cleansing compound shall be distributed, over the entire contact between the seat and the ball, without discontinuity.

The results of design validation shall be documented.

Add new Annex N

Annex N **(normative)**

Material Tables for Valves

This annex provides acceptable and optional component materials.

When an IOGP S-562 material class is specified, the components shall be manufactured from materials listed in the corresponding table.

NOTE 1 Table N.1 are material classes designated N1 with suffix (e.g., N1a) and Table N.2 are material classes designated with alphanumeric designations (e.g., 10N).

When an IOGP S-562 material class is not specified, the materials shall be selected from the permissible alternatives in Table N.1 for the corresponding basic body material.

NOTE 2 Table N.1 is intended to provide permissible material combinations for a corresponding basic body material. The purchaser can further restrict the selection of some of these materials.

NOTE 3 Table N.2 is intended to list standard trims with limited alternatives leading to standardization but allowing the purchaser to have more control of materials proposed than in Table N.1.

NOTE 4 When IOGP S-562 material class is not specified, basic body material, service and nominal trim material need to be specified to use Table N.1.

Add new Table N.1**Table N.1—Basic Material Combinations Table**

Basic Material			NTCS [-20 °F (-29 °C) to 302 °F (150 °C)]									
IOGP S-562 Material Class			N1a									
Valve Options to Be Specified by the Purchaser:												
— Service			Sweet									
— Nominal Trim Material			NTCS + ENP ^a									
— Corrosion Allowance			As specified									
— Seat Sealing			Soft (RPTFE / PCTFE / PEEK)									
— Seal			O-rings [≥ -20 °F (-29 °C)]									
— CRA Weld Overlay Seal Pockets			N/A									
		Component Type	PC			PR	PW					
			Body / Bonnet / Auxiliary Flange	Stem	Bolting	Ball, Seat, Trunnion	Springs	Bearings	Seat Sealing ≤ 300#	Seat Sealing ≥ 600#	Seals ≤ 600#	Seals ≥ 900#
Valve parts grouped as follows: PC = Pressure-containing parts as defined by API 6D 3.1 PR = Pressure-controlling parts as defined by API 6D 3.1 PW = Process-wetted parts excluding PC and PR												
Material Selection (Specification and/or Grade)		MDS/EDS	A = Acceptable alternative / O = Option to be specified by the purchaser									
A105N/ A105NT/ A105QT	IC004	Pressure-containing parts	A			A ^a						
A216 WCB	IC006		A			O ^a						
A216 WCC	IC006		A			O ^a						
A516 Gr.60/ Gr.65/ Gr.70	IC005											
A350 LF2 Class 1	IC104		A			A ^a						
A350 LF6 Class 1 or 2	IC104		A									
A352 LCC	IC106		A			O ^a						
A516 Gr.60/ Gr.65/ Gr.70	IC105											
A350 LF3 Class 2	IL104		O			O ^a						
A694 F52	IX124		A			A ^a						
A694 F60	IX124		A			A ^a						
A694 F65	IX124		A			A ^a						
A182 F6A	-			A								
A182 FXM-19	-			A ^b								
A479 UNS S20910 XM-19	-			A ^b								
A479 UNS S41000	-			A								
A276 T410/A276 T420	-			A								
A564 Gr. 630 UNS S17400 (H1150M / H1150D)	-			A								
A705 Gr. 630 UNS S17400 (H1150M / H1150D)	-			A								
A182 F316/316L	IS104			A ^b		A ^b						
A276 316/316L	IS107			A ^b		A ^b						
A479 316/316L	IS107			A ^b		A ^b						
A351 CF3M/CF8M	IS106					A ^b						
A240 316/316L	IS105											
A182 F51	ID144			A		A						
A182 F53/F55	ID254			A		A						
A276 UNS S31803	ID147			A		A						
A276 UNS S32750 / UNS32760	ID257			A		A						
A479 UNS S31803	ID147			A		A						
A479 UNS S32750 / UNS32760	ID257			A		A						
A995 Gr. 4A	ID146					A						
A995 Gr. 6A	ID256					A						
A240 UNS S31803 / UNS S32205	ID145											
A240 UNS S32550 / UNS S32750 / UNS S32760	ID255											
A494 CW-6MC	IN106S					A						
B446 UNS N06625	IN107S			A		A						
B564 UNS N06625	IN104S			A		A						
B443 UNS N06625	IN105S											
B637 UNS N07718 ^c	-			A		A						
UNS N06625	-	Spring material					A					
UNS N07718	-						A					
UNS N07750	-						A					
UNS N10276	-						A					
UNS R30003	-						A					
316 + PTFE	-	Bearing material						A				
625 + PTFE	-							A				
A193 B7 / A194 2H	IX120	Bolting materials			A							
A320 L43 / A194 7	IX100				A							
A320 L7 / A194 7	IX100				A							
A320 L7M / A194 7M	IX100				A							
RPTFE	-	Seat sealing							A	O		
PCTFE	-								O ^d	O ^d		
PEEK	-								O	A		
FKM LT RGD	-	Sealing								O		
FKM LT RGD + Back-up rings both sides (RPTFE or PEEK)	-									O		
HNBR RGD	-									O		
HNBR RGD + Back-up rings both sides (RPTFE or PEEK)	-									O		

Table N.1 (continued)

Basic Material			NTCS [-20 °F (-29 °C) to 302 °F (150 °C)]									
IOGP S-562 Material Class			N1b									
Valve Options to Be Specified by the Purchaser:												
— Service			Sour NACE									
— Nominal Trim Material			316 Stainless Steel									
— Corrosion Allowance			As specified									
— Seat Sealing			Soft (RPTFE / PCTFE / PEEK) or Metal (TCC)									
— Seal			O-rings [≥ -20 °F (-29 °C)]									
— CRA Weld Overlay Seal Pockets			316SS (see 6.1.1 para 7)									
		Component Type	PC			PR	PW					
			Body / Bonnet / Auxiliary Flange	Stem	Bolting	Ball, Seat, Trunion	Springs	Bearings	Seat Sealing ≤ 300#	Seat Sealing ≥ 600#	Seals ≤ 600#	Seals ≥ 900#
Valve parts grouped as follows: PC = Pressure-containing parts as defined by API 6D 3.1 PR = Pressure-controlling parts as defined by API 6D 3.1 PW = Process-wetted parts excluding PC and PR												
Material Selection (Specification and/or Grade)		MDS/EDS	A = Acceptable alternative / O = Option to be specified by the purchaser									
A105N/ A105NT/ A105QT		IC004S	Pressure-containing parts	A			A ^e					
A216 WCB		IC006S		A								
A216 WCC		IC006S		A								
A350 LF2 Class 1		IC004S		A			A ^e					
A350 LF6 Class 1 or 2		IC004S		A			A ^e					
A352 LCC		IC006S		A								
A350 LF3 Class 2		IL104		O			O ^e					
A694 F52		IX124S		A			A ^e					
A694 F60		IX124S		A			A ^e					
A694 F65		IX124S		A			A ^e					
A182 FXM-19		-			A							
A479 UNS S20910 XM-19		-			A							
A564 Gr. 630 UNS S17400 (H1150M / H1150D)		-			A ^f		A ^f					
A705 Gr. 630 UNS S17400 (H1150M / H1150D)		-			A ^f		A ^f					
A182 F316/316L		IS104S			A		A					
A276 316/316L		IS107S			A		A					
A479 316/316L		IS107S			A		A					
A351 CF3M/CF8M		IS106S					A					
A240 316/316L		IS105										
A182 F51		ID144S			A		A					
A182 F53/F55		ID254S			A		A					
A276 UNS S31803		ID147S			A		A					
A276 UNS S32750 / UNS32760		ID257S			A		A					
A479 UNS S31803		ID147S			A		A					
A479 UNS S32750 / UNS32760		ID257S			A		A					
A995 Gr. 4A		ID146S					A					
A995 Gr. 6A		ID256S					A					
A240 UNS S31803 / UNS S32205		ID145S										
A240 UNS S32550 / UNS S32750 / UNS S32760		ID255S										
A494 CW-6MC		IN106S					A					
B446 UNS N06625		IN107S			A		A					
B564 UNS N06625		IN104S			A		A					
B443 UNS N06625		IN105S										
B637 UNS N07718		-		A		A						
UNS N06625		-	Spring material					A				
UNS N10276		-						A				
UNS R30003		-						A				
316 + PTFE		-	Bearing material						A			
625 + PTFE		-							A			
A193 B7M / A194 2HM		IX120S	Bolting materials			A						
A320 L7M / A194 7M		IX100S				A						
RPTFE		-	Seat sealing							A	O	
PCTFE		-								O ^d	O ^d	
PEEK		-								O ^g	A ^g	
Tungsten Carbide Coating HVOF hardfacing		IH002				A ^h			A ^h	A ^h		
FKM LT RGD		-	Sealing								O	
FKM LT RGD + Back-up rings both sides (RPTFE or PEEK)		-										O
HNBR RGD		-										O
HNBR RGD + Back-up rings both sides (RPTFE or PEEK)		-										O

Table N.1 (continued)

Basic Material			NTCS [-20 °F (-29 °C) to 302 °F (150 °C)]									
IOGP S-562 Material Class			N1c									
Valve Options to Be Specified by the Purchaser:												
— Service			Sour NACE									
— Nominal Trim Material			Duplex Stainless Steel									
— Corrosion Allowance			As specified									
— Seat Sealing			Soft (RPTFE / PCTFE / PEEK) or Metal (TCC)									
— Seal			O-rings [≥ -20 °F (-29 °C)]									
— CRA Weld Overlay Seal Pockets			Alloy 625 (see 6.1.1 para 7)									
Valve parts grouped as follows: PC = Pressure-containing parts as defined by API 6D 3.1 PR = Pressure-controlling parts as defined by API 6D 3.1 PW = Process-wetted parts excluding PC and PR		Component Type	PC			PR	PW					
			Body / Bonnet / Auxiliary Flange	Stem	Bolting	Ball, Seat, Trunion	Springs	Bearings	Seat Sealing ≤ 300#	Seat Sealing ≥ 600#	Seals ≤ 600#	Seals ≥ 900#
Material Selection (Specification and/or Grade)		MDS/EDS	A = Acceptable alternative / O = Option to be specified by the purchaser									
A105N/ A105NT/ A105QT	IC004S	Pressure-containing parts	A			A ^e						
A216 WCB	IC006S		A									
A216 WCC	IC006S		A									
A350 LF2 Class 1	IC004S		A			A ^e						
A350 LF6 Class 1 or 2	IC004S		A			A ^e						
A352 LCC	IC006S		A									
A350 LF3 Class 2	IL104		O			O ^e						
A694 F52	IX124S		A			A ^e						
A694 F60	IX124S		A			A ^e						
A694 F65	IX124S		A			A ^e						
A182 F51	ID144S			A		A						
A182 F53/F55	ID254S			A		A						
A276 UNS S31803	ID147S			A		A						
A276 UNS S32750 / UNS32760	ID257S			A		A						
A479 UNS S31803	ID147S			A		A						
A479 UNS S32750 / UNS32760	ID257S			A		A						
A995 Gr. 4A	ID146S					A						
A995 Gr. 6A	ID256S					A						
A240 UNS S31803 / UNS S32205	ID145S											
A240 UNS S32550 / UNS S32750 / UNS S32760	ID255S											
A494 CW-6MC	IN106S					A						
B446 UNS N06625	IN107S			A		A						
B564 UNS N06625	IN104S			A		A						
B443 UNS N06625	IN105S											
B637 UNS N07718	-			A		A						
UNS N06625	-	Spring material					A					
UNS N10276	-						A					
UNS R30003	-						A					
625 + PTFE	-	Bearing material						A				
A193 B7M / A194 2HM	IX120S	Bolting materials			A							
A320 L7M / A194 7M	IX100S				A							
RPTFE	-	Seat sealing							A	O		
PCTFE	-								O ^d	O ^d		
PEEK	-								O ^g	A ^g		
Tungsten Carbide Coating HVOF hardfacing	IH002					A ^h			A ^h	A ^h	O	
FKM LT RGD	-	Sealing									O	
FKM LT RGD + Back-up rings both sides (RPTFE or PEEK)	-										O	
HNBR RGD	-										O	
HNBR RGD + Back-up rings both sides (RPTFE or PEEK)	-										O	

Table N.1 (continued)

Basic Material			LTCS [-50 °F (-46 °C) to 302 °F (150 °C)]									
IOGP S-562 Material Class			N1d									
Valve Options to Be Specified by the Purchaser:												
— Service			Sweet									
— Nominal Trim Material			LT Carbon Steel + ENP ^a									
— Corrosion Allowance			As specified									
— Seat Sealing			Soft (RPTFE / PCTFE / PEEK)									
— Seal			O-rings [≥ -20 °F (-29 °C)] or Lip Seals [≥ -50 °F (-46 °C)]									
— CRA Weld Overlay Seal Pockets			316SS for Lip Seals									
Valve parts grouped as follows: PC = Pressure-containing parts as defined by API 6D 3.1 PR = Pressure-controlling parts as defined by API 6D 3.1 PW = Process-wetted parts excluding PC and PR		Component Type	PC			PR	PW					
			Body / Bonnet / Auxiliary Flange	Stem	Bolting	Ball, Seat, Trunion	Springs	Bearings	Seat Sealing ≤ 300#	Seat Sealing ≥ 600#	Seals ≤ 600#	Seals ≥ 900#
Material Selection (Specification and/or Grade)		MDS/EDS	A = Acceptable alternative / O = Option to be specified by the purchaser									
A350 LF2 Class 1	IC104	Pressure-containing parts	A			A ^a						
A350 LF6 Class 1 or 2	IC104		A			A ^a						
A352 LCC	IC106		A			O ^a						
A516 Gr.60/ Gr.65/ Gr.70	IC105											
A694 F52	IX124		A			A ^a						
A694 F60	IX124		A			A ^a						
A694 F65	IX124		A			A ^a						
A350 LF3 Class 2	IL104		O			O ^a						
A182 FXM-19	-			A ^b								
A479 UNS S20910 XM-19	-			A ^b								
A182 F316/316L	IS104			A ^b		A ^b						
A276 316/316L	IS107			A ^b		A ^b						
A479 316/316L	IS107			A ^b		A ^b						
A351 CF3M/CF8M	IS106			-		A ^b						
A240 316/316L	IS105											
A182 F51	ID144			A		A						
A182 F53/F55	ID254			A		A						
A276 UNS S31803	ID147			A		A						
A276 UNS S32750 / UNS32760	ID257			A		A						
A479 UNS S31803	ID147			A		A						
A479 UNS S32750 / UNS32760	ID257			A		A						
A995 Gr. 4A	ID146					A						
A995 Gr. 6A	ID256					A						
A240 UNS S31803 / UNS S32205	ID145											
A240 UNS S32550 / UNS S32750 / UNS S32760	ID255											
A494 CW-6MC	IN106S					A						
B446 UNS N06625	IN107S			A		A						
B564 UNS N06625	IN104S			A		A						
B443 UNS N06625	IN105S											
B637 UNS N07718	-			A		A						
UNS N06625	-	Spring material					A					
UNS N07718	-						A					
UNS N07750	-						A					
UNS N10276	-						A					
UNS R30003	-						A					
316 + PTFE	-	Bearing material						A				
625 + PTFE	-							A				
A320 L43 / A194 7	IX100	Bolting materials			A							
A320 L7 / A194 7	IX100				A							
A320 L7M / A194 7M	IX100				A							
RPTFE	-	Seat sealing							A	O		
PCTFE	-								O ^d	O ^d		
PEEK	-								O	A		
FKM LT RGD	-	Sealing									O	
FKM LT RGD + Back-up rings both sides (RPTFE or PEEK)	-										O	
HNBR RGD	-										O	
HNBR RGD + Back-up rings both sides (RPTFE or PEEK)	-										O	
PTFE Lip Seal + Elgiloy Spring + Anti-Collapse	-										O	
V-packing (chevron) seals	-										O	

Table N.1 (continued)

Basic Material			LTCS [-50 °F (-46 °C) to 302 °F (150 °C)]									
IOGP S-562 Material Class			N1e									
Valve Options to Be Specified by the Purchaser:												
— Service			Sour NACE									
— Nominal Trim Material			316 Stainless Steel									
— Corrosion Allowance			As specified									
— Seat Sealing			Soft (RPTFE / PCTFE / PEEK) or Metal (TCC)									
— Seal			O-rings [≥ -20 °F (-29 °C)] or Lip Seals [≥ -50 °F (-46 °C)]									
— CRA Weld Overlay Seal Pockets			316SS (see 6.1.1 para 7)									
		Component Type	PC			PR	PW					
Valve parts grouped as follows: PC = Pressure-containing parts as defined by API 6D 3.1 PR = Pressure-controlling parts as defined by API 6D 3.1 PW = Process-wetted parts excluding PC and PR			Body / Bonnet / Auxiliary Flange	Stem	Bolting	Ball, Seat, Trunion	Springs	Bearings	Seat Sealing ≤ 300#	Seat Sealing ≥ 600#	Seals ≤ 600#	Seals ≥ 900#
Material Selection (Specification and/or Grade)		MDS/EDS	A = Acceptable alternative / O = Option to be specified by the purchaser									
A350 LF2 Class 1	IC004S	Pressure-containing parts	A			A ^e						
A350 LF6 Class 1 or 2	IC004S		A			A ^e						
A352 LCC	IC006S		A									
A350 LF3 Class 2	IL104		O			O ^e						
A694 F52	IX124S		A			A ^e						
A694 F60	IX124S		A			A ^e						
A694 F65	IX124S		A			A ^e						
A182 FXM-19	-			A								
A479 UNS S20910 XM-19	-			A								
A182 F316/316L	IS104S			A		A						
A276 316/316L	IS107S			A		A						
A479 316/316L	IS107S			A		A						
A351 CF3M/CF8M	IS106S					A						
A240 316/316L	IS105											
A182 F51	ID144S			A		A						
A182 F53/F55	ID254S			A		A						
A276 UNS S31803	ID147S			A		A						
A276 UNS S32750 / UNS32760	ID257S			A		A						
A479 UNS S31803	ID147S			A		A						
A479 UNS S32750 / UNS32760	ID257S			A		A						
A995 Gr. 4A	ID146S					A						
A995 Gr. 6A	ID256S					A						
A240 UNS S31803 / UNS S32205	ID145S											
A240 UNS S32550 / UNS S32750 / UNS S32760	ID255S											
A494 CW-6MC	IN106S					A						
B446 UNS N06625	IN107S			A		A						
B564 UNS N06625	IN104S			A		A						
B443 UNS N06625	IN105S											
B637 UNS N07718	-			A		A						
UNS N06625	-	Spring material						A				
UNS N10276	-							A				
UNS R30003	-							A				
316 + PTFE	-	Bearing material							A			
625 + PTFE	-								A			
A320 L7M / A194 7M	IX100S	Bolting materials			A							
RPTFE	-	Seat sealing								A	O	
PCTFE	-									O ^d	O ^d	
PEEK	-									O ^g	A ^g	
Tungsten Carbide Coating HVOF hardfacing	IH002	Sealing				A ^h				A ^h	A ^h	
FKM LT RGD	-										O	
FKM LT RGD + Back-up rings both sides (RPTFE or PEEK)	-										O	O
HNBR RGD	-										O	
HNBR RGD + Back-up rings both sides (RPTFE or PEEK)	-										O	O
PTFE Lip Seal + Elgiloy Spring + Anti-Collapse	-										O	O
V-packing (chevron) seals	-										O	O

Table N.1 (continued)

Basic Material			LTCS [-50 °F (-46 °C) to 302 °F (150 °C)]										
IOGP S-562 Material Class			N1f										
Valve Options to Be Specified by the Purchaser:													
— Service			Sour NACE										
— Nominal Trim Material			Duplex Stainless Steel										
— Corrosion Allowance			As specified										
— Seat Sealing			Soft (RPTFE / PCTFE / PEEK) or Metal (TCC)										
— Seal			O-rings [≥ -20 °F (-29 °C)] or Lip Seals [≥ -50 °F (-46 °C)]										
— CRA Weld Overlay Seal Pockets			Alloy 625 (see 6.1.1 para 7)										
Valve parts grouped as follows: PC = Pressure-containing parts as defined by API 6D 3.1 PR = Pressure-controlling parts as defined by API 6D 3.1 PW = Process-wetted parts excluding PC and PR		Component Type	PC			PR	PW						
			Body / Bonnet / Auxiliary Flange	Stem	Bolting	Ball, Seat, Trunion	Springs	Bearings	Seat Sealing ≤ 300#	Seat Sealing ≥ 600#	Seals ≤ 600#	Seals ≥ 900#	
Material Selection (Specification and/or Grade)		MDS/EDS	A = Acceptable alternative / O = Option to be specified by the purchaser										
A350 LF2 Class 1		IC004S	Pressure-containing parts	A			A ^e						
A350 LF6 Class 1 or 2		IC004S		A			A ^e						
A352 LCC		IC006S		A									
A350 LF3 Class 2		IL104		O			O ^e						
A694 F52		IX124S		A			A ^e						
A694 F60		IX124S		A			A ^e						
A694 F65		IX124S		A			A ^e						
A182 F51		ID144S			A		A						
A182 F53/F55		ID254S			A		A						
A276 UNS S31803		ID147S			A		A						
A276 UNS S32750 / UNS32760		ID257S			A		A						
A479 UNS S31803		ID147S			A		A						
A479 UNS S32750 / UNS32760		ID257S			A		A						
A995 Gr. 4A		ID146S					A						
A995 Gr. 6A		ID256S					A						
A240 UNS S31803 / UNS S32205		ID145S											
A240 UNS S32550 / UNS S32750 / UNS S32760		ID255S											
A494 CW-6MC		IN106S					A						
B446 UNS N06625		IN107S			A		A						
B564 UNS N06625		IN104S			A		A						
B443 UNS N06625		IN105S											
B637 UNS N07718		-			A		A						
UNS N06625		-	Spring material					A					
UNS N10276		-						A					
UNS R30003		-						A					
625 + PTFE		-	Bearing material						A				
A320 L7M / A194 7M		IX100S	Bolting materials			A							
RPTFE		-	Seat sealing							A	O		
PCTFE		-									O ^d	O ^d	
PEEK		-									O ^g	A ^g	
Tungsten Carbide Coating HVOF hardfacing		IH002				A ^h				A ^h	A ^h		
FKM LT RGD		-	Sealing									O	
FKM LT RGD + Back-up rings both sides (RPTFE or PEEK)		-										O	O
HNBR RGD		-										O	
HNBR RGD + Back-up rings both sides (RPTFE or PEEK)		-										O	O
PTFE Lip Seal + Elgiloy Spring + Anti-Collapse		-										O	O
V-packing (chevron) seals		-										O	O

Table N.1 (continued)

Basic Material			LTCS + Alloy 625 Clad [≥ NPS 4 (DN 100)] [-50 °F (-46 °C) to 302 °F (150 °C)]									
IOGP S-562 Material Class			N1g									
Valve Options to Be Specified by the Purchaser:												
— Service			Sour NACE									
— Nominal Trim Material			Alloy 625									
— Corrosion Allowance			N/A									
— Seat Sealing			Soft (RPTFE / PEEK) or Metal (TCC)									
— Seal			O-rings [≥ -20 °F (-29 °C)] or Lip Seals [≥ -50 °F (-46 °C)]									
— CRA Weld Overlay Seal Pockets			Alloy 625 weld overlay to be applied on all wetted body surfaces									
Valve parts grouped as follows: PC = Pressure-containing parts as defined by API 6D 3.1 PR = Pressure-controlling parts as defined by API 6D 3.1 PW = Process-wetted parts excluding PC and PR		Component Type	PC			PR	PW					
			Body / Bonnet / Auxiliary Flange	Stem	Bolting	Ball, Seat, Trunnion	Springs	Bearings	Seat Sealing ≤ 300#	Seat Sealing ≥ 600#	Seals ≤ 600#	Seals ≥ 900#
Material Selection (Specification and/or Grade)		MDS/EDS	A = Acceptable alternative / O = Option to be specified by the purchaser									
A350 LF2 Class 1	IC004S	Pressure-containing parts	A °			A °						
A350 LF6 Class 1 or 2	IC004S		A °			A °						
A352 LCC	IC006S		A °			O °						
A516 Gr.60/ Gr.65/ Gr.70	IC105											
A350 LF3 Class 2	IL104		O			O °						
A694 F52	IX124S		A °			A °						
A694 F60	IX124S		A °			A °						
A694 F65	IX124S		A °			A °						
A494 CW-6MC	IN106S					A						
B446 UNS N06625	IN107S			A		A						
B564 UNS N06625	IN104S			A		A						
B443 UNS N06625	IN105S											
B637 UNS N07718	-			O		O						
UNS N06625	-	Spring material					A					
UNS N10276	-						A					
UNS R30003	-						A					
625 + PTFE	-	Bearing material						A				
A320 L7M / A194 7M	IX100S	Bolting materials			A							
RPTFE	-	Seat sealing							A	O		
PCTFE	-								O ^d	O ^d		
PEEK	-								O ^g	A ^g		
Tungsten Carbide Coating HVOF hardfacing	IH002					A ^h			A ^h	A ^h		
FKM LT RGD	-	Sealing									O	
FKM LT RGD + Back-up rings both sides (RPTFE or PEEK)	-										O	O
HNBR RGD	-										O	
HNBR RGD + Back-up rings both sides (RPTFE or PEEK)	-										O	O
PTFE Lip Seal + Elgiloy Spring + Anti-Collapse	-										O	O
V-packing (chevron) seals	-										O	O

Table N.1 (continued)

Basic Material			SS316 [-50 °F (-46 °C) to 302 °F (150 °C)]									
IOGP S-562 Material Class			N1h									
Valve Options to Be Specified by the Purchaser:												
— Service			Sour NACE									
— Nominal Trim Material			316 Stainless Steel									
— Corrosion Allowance			N/A									
— Seat Sealing			Soft (RPTFE / PEEK) or Metal (TCC)									
— Seal			O-rings [≥ -20 °F (-29 °C)] or Lip Seals [≥ -50 °F (-46 °C)]									
— CRA Weld Overlay Seal Pockets			N/A									
Valve parts grouped as follows: PC = Pressure-containing parts as defined by API 6D 3.1 PR = Pressure-controlling parts as defined by API 6D 3.1 PW = Process-wetted parts excluding PC and PR		Component Type	PC			PR	PW					
			Body / Bonnet / Auxiliary Flange	Stem	Bolting	Ball, Seat, Trunnion	Springs	Bearings	Seat Sealing ≤ 300#	Seat Sealing ≥ 600#	Seals ≤ 600#	Seals ≥ 900#
Material Selection (Specification and/or Grade)		MDS/EDS	A = Acceptable alternative / O = Option to be specified by the purchaser									
A350 LF2 Class 1	IC104	Pressure-containing parts				A ^e						
A350 LF6 Class 1 or 2	IC104					A ^e						
A352 LCC	IC106					O ^e						
A516 Gr.60/ Gr.65/ Gr.70	IC105											
A350 LF3 Class 2	IL104					O ^e						
A694 F52	IX124					A ^e						
A694 F60	IX124					A ^e						
A694 F65	IX124					A ^e						
A182 FXM-19	-			A		A						
A479 UNS S20910 XM-19	-			A		A						
A182 F316/316L	IS104S		A	A		A						
A276 316/316L	IS107S			A		A						
A479 316/316L	IS107S			A		A						
A351 CF3M/CF8M	IS106S		A			A						
A240 316/316L	IS105											
A182 F51	ID144S			A		A						
A182 F53/F55	ID254S			A		A						
A276 UNS S31803	ID147S			A		A						
A276 UNS S32750 / UNS32760	ID257S			A		A						
A479 UNS S31803	ID147S			A		A						
A479 UNS S32750 / UNS32760	ID257S			A		A						
A995 Gr. 4A	ID146S					A						
A995 Gr. 6A	ID256S					A						
A240 UNS S31803 / UNS S32205	ID145S											
A240 UNS S32550 / UNS S32750 / UNS S32760	ID255S											
A494 CW-6MC	IN106S					A						
B446 UNS N06625	IN107S			A		A						
B564 UNS N06625	IN104S			A		A						
B443 UNS N06625	IN105S											
B637 UNS N07718	-			A		A						
UNS N06625	-	Spring material					A					
UNS N10276	-						A					
UNS R30003	-					A						
316 + PTFE	-	Bearing material						A				
625 + PTFE	-							A				
A193 B8M Class 1 / A194 8M / A194 8MA	-	Bolting materials			A							
A193 B8M Class 2 / A194 8M / A194 8MA	-				A							
A193 B8M2 Class 2B / A194 8M / A194 8MA	-				A							
A193 B8M3 Class 2C / A194 8M / A194 8MA	-				A							
A193 B8MLCuNA / A194 Gr. 8MLCuNA	-				A							
A193 B8MLCuN-CLASS 1B / A194 Gr. 9CA	-				A							
UNS N07718 to API 6ACRA (120K)	IN120S				A							
RPTFE	-	Seat sealing						A	O			
PCTFE	-							O ^d	O ^d			
PEEK	-							O ^g	A ^g			
Tungsten Carbide Coating HVOF hardfacing	IH002	Sealing				A ^h		A ^h	A ^h			
FKM LT RGD	-									O		
FKM LT RGD + Back-up rings both sides (RPTFE or PEEK)	-									O		
HNBR RGD	-									O		
HNBR RGD + Back-up rings both sides (RPTFE or PEEK)	-									O		
PTFE Lip Seal + Elgiloy Spring + Anti-Collapse	-									O		
V-packing (chevron) seals	-									O		

Table N.1 (continued)

Basic Material			DSS [-50 °F (-46 °C) to 302 °F (150 °C)]									
IOGP S-562 Material Class			N1i									
Valve Options to Be Specified by the Purchaser:												
— Service			Sour NACE									
— Nominal Trim Material			Duplex Stainless Steel									
— Corrosion Allowance			N/A									
— Seat Sealing			Soft (RPTFE / PEEK) or Metal (TCC)									
— Seal			O-rings [≥ -20 °F (-29 °C)] or Lip Seals [≥ -50 °F (-46 °C)]									
— CRA Weld Overlay Seal Pockets			N/A									
		Component Type	PC			PR	PW					
			Body / Bonnet / Auxiliary Flange	Stem	Bolting	Ball, Seat, Trunnion	Springs	Bearings	Seat Sealing ≤ 300#	Seat Sealing ≥ 600#	Seals ≤ 600#	Seals ≥ 900#
Valve parts grouped as follows: PC = Pressure-containing parts as defined by API 6D 3.1 PR = Pressure-controlling parts as defined by API 6D 3.1 PW = Process-wetted parts excluding PC and PR												
Material Selection (Specification and/or Grade)		MDS/EDS	A = Acceptable alternative / O = Option to be specified by the purchaser									
A350 LF2 Class 1	IC104	Pressure-containing parts				A ^e						
A350 LF6 Class 1 or 2	IC104					A ^e						
A352 LCC	IC106					O ^e						
A516 Gr.60/ Gr.65/ Gr.70	IC105											
A350 LF3 Class 2	IL104					O ^e						
A694 F52	IX124					A ^e						
A694 F60	IX124					A ^e						
A694 F65	IX124					A ^e						
A182 F51	ID144S		A	A		A						
A182 F53/F55	ID254S			A		A						
A276 UNS S31803	ID147S			A		A						
A276 UNS S32750 / UNS32760	ID257S			A		A						
A479 UNS S31803	ID147S			A		A						
A479 UNS S32750 / UNS32760	ID257S			A		A						
A995 Gr. 4A	ID146S		A			A						
A995 Gr. 6A	ID256S					A						
A240 UNS S31803 / UNS S32205	ID145S											
A240 UNS S32550 / UNS S32750 / UNS S32760	ID255S											
A494 CW-6MC	IN106S					A						
B446 UNS N06625	IN107S				A	A						
B564 UNS N06625	IN104S				A	A						
B443 UNS N06625	IN105S											
B637 UNS N07718	-				A		A					
UNS N06625	-	Spring material					A					
UNS N10276	-						A					
UNS R30003	-						A					
625 + PTFE	-	Bearing material						A				
A193 B8MLCuNA / A194 Gr. 8MLCuNA	-	Bolting materials			A							
A193 B8MLCuN-CLASS 1B / A194 Gr. 9CA	-				A							
UNS N07718 to API 6ACRA (120K)	IN120S				A							
A1082 UNS S32750, S32760	ID260S			A								
RPTFE	-	Seat sealing							A	O		
PCTFE	-								O ^d	O ^d		
PEEK	-								O ^g	A ^g		
Tungsten Carbide Coating HVOF hardfacing	IH002					A ^h			A ^h	A ^h		
FKM LT RGD	-	Sealing									O	
FKM LT RGD + Back-up rings both sides (RPTFE or PEEK)	-										O	O
HNBR RGD	-										O	
HNBR RGD + Back-up rings both sides (RPTFE or PEEK)	-										O	O
PTFE Lip Seal + Elgiloy Spring + Anti-Collapse	-										O	O
V-packing (chevron) seals	-										O	O

Table N.1 (continued)

Basic Material			SDSS [-50 °F (-46 °C) to 302 °F (150 °C)]										
IOGP S-562 Material Class			N1j										
Valve Options to Be Specified by the Purchaser:													
— Service			Seawater ¹ / Sour NACE										
— Nominal Trim Material			Super Duplex Stainless Steel										
— Corrosion Allowance			N/A										
— Seat Sealing			Soft (RPTFE / PEEK) or Metal (TCC)										
— Seal			O-rings [≥ -20 °F (-29 °C)] or Lip Seals [≥ -50 °F (-46 °C)]										
— CRA Weld Overlay Seal Pockets			N/A										
Valve parts grouped as follows: PC = Pressure-containing parts as defined by API 6D 3.1 PR = Pressure-controlling parts as defined by API 6D 3.1 PW = Process-wetted parts excluding PC and PR		Component Type	PC			PR	PW						
			Body / Bonnet / Auxiliary Flange	Stem	Bolting	Ball, Seat, Trunion	Springs	Bearings	Seat Sealing ≤ 300#	Seat Sealing ≥ 600#	Seals ≤ 600#	Seals ≥ 900#	
Material Selection (Specification and/or Grade)		MDS/EDS	A = Acceptable alternative / O = Option to be specified by the purchaser										
A350 LF2 Class 1	IC104	Pressure-containing parts				A ^e							
A350 LF6 Class 1 or 2	IC104					A ^e							
A352 LCC	IC106					O ^e							
A516 Gr.60/ Gr.65/ Gr.70	IC105												
A350 LF3 Class 2	IL104					O ^e							
A694 F52	IX124					A ^e							
A694 F60	IX124					A ^e							
A694 F65	IX124					A ^e							
A182 F53/F55	ID254S		A	A		A							
A276 UNS S32750 / UNS32760	ID257S			A		A							
A479 UNS S32750 / UNS32760	ID257S			A		A							
A995 Gr. 6A	ID256S		A			A							
A240 UNS S32550 / UNS S32750 / UNS S32760	ID255S												
A494 CW-6MC	IN106S					A							
B446 UNS N06625	IN107S			A		A							
B564 UNS N06625	IN104S			A		A							
B443 UNS N06625	IN105S												
B637 UNS N07718	-			A ^c		A ^c							
UNS N06625	-	Spring material					A						
UNS N10276	-						A						
UNS R30003	-						A						
625 + PTFE	-	Bearing material						A					
A193 B8MLCuNA / A194 Gr. 8MLCuNA	-	Bolting materials			A								
A193 B8MLCuN-CLASS 1B / A194 Gr. 9CA	-				A								
UNS N07718 to API 6ACRA (120K)	IN120S				A								
A1082 UNS S32750, S32760	ID260S				A								
RPTFE	-	Seat sealing							A	O			
PCTFE	-								O ^d	O ^d			
PEEK	-								O ^g	A ^g			
Tungsten Carbide Coating HVOF hardfacing	IH002					A ^h			A ^h	A ^h			
FKM LT RGD	-	Sealing									O		
FKM LT RGD + Back-up rings both sides (RPTFE or PEEK)	-										O	O	
HNBR RGD	-										O		
HNBR RGD + Back-up rings both sides (RPTFE or PEEK)	-										O	O	
PTFE Lip Seal + Elgiloy Spring + Anti-Collapse	-										O	O	
V-packing (chevron) seals	-										O	O	

Table N.1 (continued)

Basic Material			Alloy 625 [-50 °F (-46 °C) to 302 °F (150 °C)]									
IOGP S-562 Material Class			N1k									
Valve Options to Be Specified by the Purchaser:												
— Service			Sour NACE									
— Nominal Trim Material			Alloy 625									
— Corrosion Allowance			N/A									
— Seat Sealing			Soft (RPTFE / PEEK) or Metal (TCC)									
— Seal			O-rings [≥ -20 °F (-29 °C)] or Lip Seals [≥ -50 °F (-46 °C)]									
— CRA Weld Overlay Seal Pockets			N/A									
		Component Type	PC			PR	PW					
			Body / Bonnet / Auxiliary Flange	Stem	Bolting	Ball, Seat, Trunion	Springs	Bearings	Seat Sealing ≤ 300#	Seat Sealing ≥ 600#	Seals ≤ 600#	Seals ≥ 900#
Valve parts grouped as follows: PC = Pressure-containing parts as defined by API 6D 3.1 PR = Pressure-controlling parts as defined by API 6D 3.1 PW = Process-wetted parts excluding PC and PR												
Material Selection (Specification and/or Grade)		MDS/EDS	A = Acceptable alternative / O = Option to be specified by the purchaser									
A350 LF2 Class 1		IC004S	Pressure-containing parts				A ^e					
A350 LF6 Class 1 or 2		IC004S					A ^e					
A352 LCC		IC006S					O ^e					
A516 Gr.60/ Gr.65/ Gr.70		IC105										
A350 LF3 Class 2		IL104					O ^e					
A694 F52		IX124S					A ^e					
A694 F60		IX124S					A ^e					
A694 F65		IX124S					A ^e					
A494 CW-6MC		IN106S					A					
B446 UNS N06625		IN107S				A	A					
B564 UNS N06625		IN104S				A	A					
B443 UNS N06625		IN105S										
B637 UNS N07718		-				O		O				
UNS N06625		-		Spring material					A			
UNS N10276		-						A				
UNS R30003		-						A				
316 + PTFE		-	Bearing material									
625 + PTFE		-							A			
A193 B8M Class 1 / A194 8M / A194 8MA		-	Bolting materials			A						
A193 B8M Class 2 / A194 8M / A194 8MA		-				A						
A193 B8M2 Class 2B / A194 8M / A194 8MA		-				A						
A193 B8M3 Class 2C / A194 8M / A194 8MA		-				A						
A193 B8MLCuNA / A194 Gr. 8MLCuNA		-				A						
A193 B8MLCuN-CLASS 1B / A194 Gr. 9CA		-				A						
A320 L43 / A194 7		IX100										
A320 L7 / A194 7		IX100										
A320 L7M / A194 7M		IX100S										
UNS N07718 to API 6ACRA (120K)		IN120S				A						
A1082 UNS S32750, S32760		ID260				A						
ASTM F468 UNS N06625 / ASTM F467 UNS N06625 Grade 2		IN100S			A							
RPTFE		-	Seat sealing							A ^d	O ^d	
PCTFE		-								O ^d	O ^d	
PEEK		-								O ^g	A ^g	
Tungsten Carbide Coating HVOF hardfacing		IH002				A ^h			A ^h	A ^h		
FKM LT RGD		-	Sealing								O	
FKM LT RGD + Back-up rings both sides (RPTFE or PEEK)		-									O	O
HNBR RGD		-									O	
HNBR RGD + Back-up rings both sides (RPTFE or PEEK)		-									O	O
PTFE Lip Seal + Elgiloy Spring + Anti-Collapse		-									O	O
V-packing (chevron) seals		-									O	O

Table N.1 (continued)

Basic Material			6Mo [-50 °F (-46 °C) to 302 °F (150 °C)]									
IOGP S-562 Material Class			N11									
Valve Options to Be Specified by the Purchaser:												
— Service			Sour NACE									
— Nominal Trim Material			6Mo									
— Corrosion Allowance			N/A									
— Seat Sealing			Soft (RPTFE / PEEK) or Metal (TCC)									
— Seal			O-rings [≥ -20 °F (-29 °C)] or Lip Seals [≥ -50 °F (-46 °C)]									
— CRA Weld Overlay Seal Pockets			N/A									
		Component Type	PC			PR	PW					
			Body / Bonnet / Auxiliary Flange	Stem	Bolting	Ball, Seat, Trunion	Springs	Bearings	Seat Sealing ≤ 300#	Seat Sealing ≥ 600#	Seals ≤ 600#	Seals ≥ 900#
Valve parts grouped as follows: PC = Pressure-containing parts as defined by API 6D 3.1 PR = Pressure-controlling parts as defined by API 6D 3.1 PW = Process-wetted parts excluding PC and PR												
Material Selection (Specification and/or Grade)		MDS/EDS	A = Acceptable alternative / O = Option to be specified by the purchaser									
A350 LF2 Class 1	IC004S	Pressure-containing parts				A ^e						
A350 LF6 Class 1 or 2	IC004S					A ^e						
A516 Gr.60/ Gr.65/ Gr.70	IC105											
A350 LF3 Class 2	IL104					O ^e						
A694 F52	IX124S					A ^e						
A694 F60	IX124S					A ^e						
A694 F65	IX124S					A ^e						
A494 CW-6MC	IN106S					A						
B446 UNS N06625	IN107S			A		A						
B564 UNS N06625	IN104S			A		A						
B443 UNS N06625	IN105S											
B637 UNS N07718	-			O		O						
ASTM A276 / ASTM A479 UNS S31254	IR117			A	A	A						
ASTM A182 Grade F44	IR114			A	A	A						
ASTM A351 Grade CK3MCuN, CN3MN	IR116			A								
UNS N06625	-	Spring material					A					
UNS N10276	-						A					
UNS R30003	-						A					
625 + PTFE	-	Bearing material						A				
A193 B8M Class 1 / A194 8M / A194 8MA	-	Bolting materials			A							
A193 B8M Class 2 / A194 8M / A194 8MA	-				A							
A193 B8M2 Class 2B / A194 8M / A194 8MA	-				A							
A193 B8M3 Class 2C / A194 8M / A194 8MA	-				A							
A193 B8MLCuNA / A194 Gr. 8MLCuNA	-				A							
A193 B8MLCuN-CLASS 1B / A194 Gr. 9CA	-				A							
UNS N07718 to API 6ACRA (120K)	IN120S				A							
A1082 UNS S32750, S32760	ID260				A							
ASTM F468 UNS N06625 / ASTM F467 UNS N06625 Grade 2	IN100S				A							
RPTFE	-	Seat sealing							A	O		
PCTFE	-								O ^d	O ^d		
PEEK	-								O ^g	A ^g		
Tungsten Carbide Coating HVOF hardfacing	IH002					A ^h			A ^h	A ^h		
FKM LT RGD	-	Sealing									O	
FKM LT RGD + Back-up rings both sides (RPTFE or PEEK)	-										O	O
HNBR RGD	-										O	
HNBR RGD + Back-up rings both sides (RPTFE or PEEK)	-										O	O
PTFE Lip Seal + Elgiloy Spring + Anti-Collapse	-										O	O
V-packing (chevron) seals	-									O	O	

Table N.1 (*continued*)

^a	ENP shall be applied and meet the requirements of IOGP S-563, EDS IH04.
^b	Shall not be used for chloride service.
^c	Shall not be used for seawater service.
^d	Manufacturer to recommend the maximum operating temperature limitation for PCTFE for each allowable pressure rating (150#, 300#, 600#, 900# and 1500#).
^e	Alloy 625 weld overlay shall be applied to NTCS or LTCS.
^f	Depending on the level of sourness, this material may not be suitable.
^g	TCC shall be applied to the ball when PEEK seats used with ball made of austenitic stainless steel, duplex or 6Mo material. ENP is an acceptable option when specified by the purchaser.
^h	Metal-seated valves shall have TCC HVOF hard facing on ball and seats.
ⁱ	For valves in seawater service, materials should be supplied in accordance with the referenced MDSs without the suffix "S".

Add new Table N.2**Table N.2—Standard Trim Materials**

General					Materials ^{a, o, r}							
IOGP S-562 Material Class	Nominal Body and Trim Material	Temperature Range °F (°C)	ASME Pressure Rating	Service	Pressure-containing Parts Except Stem	Stem ^h	Ball	Seat Ring, and Other Wetted parts	Bolting ^q	Springs ^s	Seat Insert ^c	Primary Seals ^{d, e, f, g, k}
10N	NTCS / NTCS + ENP	-20 to 300 (-29 to 150)	CL 150 - CL 600	Sweet	ASTM A105N / ASTM A216-WCB / ASTM A216-WCC	ASTM A479 UNS S41000 / ASTM A276 T410 / ASTM A276 T420	NTCS ⁿ + ENP ⁱ	NTCS ⁿ + ENP ⁱ	ASTM A193-B7 and A194-2H / ASTM A320-L7 and A194-7	UNS N06625 / UNS R30003 / UNS N07718 / UNS N07750	RPTFE	FKM / HNBR
11N	NTCS / NTCS + ENP	-20 to 300 (-29 to 150)	≥ CL 600	Sweet	ASTM A105N / ASTM A216-WCB / ASTM A216-WCC	ASTM A479 UNS S41000 / ASTM A276 T410 / ASTM A276 T420	NTCS ⁿ + ENP ⁱ	NTCS ⁿ + ENP ⁱ	ASTM A193-B7 and A194-2H / ASTM A320-L7 and A194-7	UNS N06625 / UNS R30003 / UNS N07718 / UNS N07750	PEEK	FKM / HNBR
10L	LTCS / LTCS + ENP	-50 to 300 (-46 to 150)	CL 150 - CL 600	Sweet	ASTM A350-LF2-1 / ASTM A352-LCC	ASTM A479 UNS S20910 (XM-19) / ASTM A182 FXM-19 / A479 316/ A182 F316	LTCS ^m + ENP ⁱ	LTCS ^m + ENP ⁱ	ASTM A320-L7 and A194-7	UNS N06625 / UNS R30003 / UNS N07718 / UNS N07750	RPTFE	FKM LT/ HNBR
11L	LTCS / LTCS + ENP	-50 to 300 (-46 to 150)	≥ CL 600	Sweet	ASTM A350-LF2-1 / ASTM A352-LCC	ASTM A479 UNS S20910 (XM-19) / ASTM A182 FXM-19 / A479 316/ A182 F316	LTCS ^m + ENP ⁱ	LTCS ^m + ENP ⁱ	ASTM A320-L7 and A194-7	UNS N06625 / UNS R30003 / UNS N07718 / UNS N07750	PEEK	FKM LT/ HNBR
20N	NTCS / 316 SS	-20 to 300 (-29 to 150)	CL 150 - CL 600	Sweet	ASTM A105N / ASTM A216-WCB / ASTM A216-WCC	ASTM A479 UNS S20910 (XM-19) / ASTM A182 FXM-19	ASTM A182-F316/316L / ASTM A351-CF3M/CF8M	ASTM A182-F316/316L / ASTM A351-CF3M/CF8M	ASTM A193-B7 and A194-2H / ASTM A320-L7 and A194-7	UNS N06625 / UNS R30003 / UNS N07718 / UNS N07750	RPTFE	FKM / HNBR
21N	NTCS / 316 SS	-20 to 300 (-29 to 150)	≥ CL 600	Sweet	ASTM A105N / ASTM A216-WCB / ASTM A216-WCC	ASTM A479 UNS S20910 (XM-19) / ASTM A182 FXM-19	[ASTM A182-F316/316L / ASTM A351-CF3M/CF8M] + ENP ^u	ASTM A182-F316/316L / ASTM A351-CF3M/CF8M	ASTM A193-B7 and A194-2H / ASTM A320-L7 and A194-7	UNS N06625 / UNS R30003 / UNS N07718 / UNS N07750	PEEK	FKM / HNBR
20S	NTCS / 316 SS Sour	-20 to 300 (-29 to 150)	CL 150 - CL 600	Sour ^j	ASTM A105N / ASTM A216-WCB / ASTM A216-WCC	ASTM A479 UNS S20910 (XM-19) / ASTM A182 FXM-19	ASTM A182-F316/316L / ASTM A351-CF3M/CF8M	ASTM A182-F316/316L / ASTM A351-CF3M/CF8M	ASTM A193-B7M and A194-2HM / ASTM A320-L7M and A194-7M	UNS N06625 / UNS R30003 / UNS N10276	RPTFE	FKM / HNBR
21S	NTCS / 316 SS Sour	-20 to 300 (-29 to 150)	≥ CL 600	Sour ^j	ASTM A105N / ASTM A216-WCB / ASTM A216-WCC	ASTM A479 UNS S20910 (XM-19) / ASTM A182 FXM-19	[ASTM A182-F316/316L / ASTM A351-CF3M/CF8M] + ENP ^u	ASTM A182-F316/316L / ASTM A351-CF3M/CF8M	ASTM A193-B7M and A194-2HM / ASTM A320-L7M and A194-7M	UNS N06625 / UNS R30003 / UNS N10276	PEEK	FKM / HNBR
20L	LTCS / 316 SS LT	-50 to 300 (-46 to 150)	CL 150 - CL 600	Sweet	ASTM A350-LF2-1 / ASTM A352-LCC	ASTM A479 UNS S20910 (XM-19) / ASTM A182 FXM-19	ASTM A182-F316/316L / ASTM A351-CF3M/CF8M	ASTM A182-F316/316L / ASTM A351-CF3M/CF8M	ASTM A320-L7 and A194-7	UNS N06625 / UNS R30003 / UNS N07718 / UNS N07750	RPTFE	FKM LT/ HNBR

Table N.2 (continued)

General					Materials ^{a, o, r}							
IOGP S-562 Material Class	Nominal Body and Trim Material	Temperature Range °F (°C)	ASME Pressure Rating	Service	Pressure-containing Parts Except Stem	Stem ^h	Ball	Seat Ring, and Other Wetted parts	Bolting ^q	Springs ^s	Seat Insert ^c	Primary Seals ^{d, e, f, g, k}
21L	LTCS / 316 SS LT	-50 to 300 (-46 to 150)	≥ CL 600	Sweet	ASTM A350-LF2-1 / ASTM A352-LCC	ASTM A479 UNS S20910 (XM-19) / ASTM A182 FXM-19	[ASTM A182-F316/316L / ASTM A351-CF3M/CF8M] + ENP ^u	ASTM A182-F316/316L / ASTM A351-CF3M/CF8M	ASTM A320-L7 and A194-7	UNS N06625 / UNS R30003 / UNS N07718 / UNS N07750	PEEK	FKM LT/ HNBR
20X	LTCS / 316 SS Sour LT	-50 to 300 (-46 to 150)	CL 150 - CL 600	Sour ^j	ASTM A350-LF2-1 / ASTM A352-LCC	ASTM A479 UNS S20910 (XM-19) / ASTM A182 FXM-19	ASTM A182-F316/316L / ASTM A351-CF3M/CF8M	ASTM A182-F316/316L / ASTM A351-CF3M/CF8M	ASTM A320-L7M and A194-7M	UNS N06625 / UNS R30003 / UNS N10276	RPTFE	FKM LT/ HNBR
21X	LTCS / 316 SS Sour LT	-50 to 300 (-46 to 150)	≥ CL 600	Sour ^j	ASTM A350-LF2-1 / ASTM A352-LCC	ASTM A479 UNS S20910 (XM-19) / ASTM A182 FXM-19	[ASTM A182-F316/316L / ASTM A351-CF3M/CF8M] + ENP ^u	ASTM A182-F316/316L / ASTM A351-CF3M/CF8M	ASTM A320-L7M and A194-7M	UNS N06625 / UNS R30003 / UNS N10276	PEEK	FKM LT/ HNBR ^k
20P	LTCS / 316 SS Sour LT	-50 to 300 (-46 to 150)	CL 150 - CL 600	Sour ^j	ASTM A350-LF2-1 / ASTM A352-LCC	ASTM A479 UNS S20910 (XM-19) / ASTM A182 FXM-19	ASTM A182-F316/316L / ASTM A351-CF3M/CF8M	ASTM A182-F316/316L / ASTM A351-CF3M/CF8M	ASTM A320-L7M and A194-7M	UNS N06625 / UNS R30003 / UNS N10276	RPTFE	PTFE Lip Seal + Elgiloy Spring + Anti-Collapse / V-Packing (Chevron)
21P	LTCS / 316 SS Sour LT	-50 to 300 (-46 to 150)	≥ CL 600	Sour ^j	ASTM A350-LF2-1 / ASTM A352-LCC	ASTM A479 UNS S20910 (XM-19) / ASTM A182 FXM-19	[ASTM A182-F316/316L / ASTM A351-CF3M/CF8M] + ENP ^u	ASTM A182-F316/316L / ASTM A351-CF3M/CF8M	ASTM A320-L7M and A194-7M	UNS N06625 / UNS R30003 / UNS N10276	PEEK	PTFE Lip Seal + Elgiloy Spring + Anti-Collapse / V-Packing (Chevron)
30S	NTCS / DSS	-20 to 300 (-29 to 150)	CL 150 - CL 600	Sour ^j	ASTM A105N / ASTM A216-WCB / ASTM A216-WCC	ASTM A182-F51 / ASTM A276 UNS S31803	ASTM A182-F51 / ASTM A276 UNS S31803 / ASTM A995-4A	ASTM A182-F51 / ASTM A276 UNS S31803 / ASTM A995-4A	ASTM A193-B7M and A194-2HM / ASTM A320-L7M and A194-7M	UNS N06625 / UNS R30003 / UNS N10276	RPTFE	FKM / HNBR
31S	NTCS / DSS	-20 to 300 (-29 to 150)	≥ CL 600	Sour ^j	ASTM A105N / ASTM A216-WCB / ASTM A216-WCC	ASTM A182-F51 / ASTM A276 UNS S31803	[ASTM A182-F51 / ASTM A276 UNS S31803 / ASTM A995-4A] + ENP ^u	ASTM A182-F51 / ASTM A276 UNS S31803 / ASTM A995-4A	ASTM A193-B7M and A194-2HM / ASTM A320-L7M and A194-7M	UNS N06625 / UNS R30003 / UNS N10276	PEEK	FKM / HNBR
30X	LTCS / DSS LT	-50 to 300 (-46 to 150)	CL 150 - CL 600	Sour ^j	ASTM A350-LF2-1 / ASTM A352-LCC	ASTM A182-F51 / ASTM A276 UNS S31803	ASTM A182-F51 / ASTM A276 UNS S31803 / ASTM A995-4A	ASTM A182-F51 / ASTM A276 UNS S31803 / ASTM A995-4A	ASTM A320-L7M and A194-7M	UNS N06625 / UNS R30003 / UNS N10276	RPTFE	FKM LT/ HNBR
31X	LTCS / DSS LT	-50 to 300 (-46 to 150)	≥ CL 600	Sour ^j	ASTM A350-LF2-1 / ASTM A352-LCC	ASTM A182-F51 / ASTM A276 UNS S31803	[ASTM A182-F51 / ASTM A276 UNS S31803 / ASTM A995-4A] + ENP ^u	ASTM A182-F51 / ASTM A276 UNS S31803 / ASTM A995-4A	ASTM A320-L7M and A194-7M	UNS N06625 / UNS R30003 / UNS N10276	PEEK	FKM LT/ HNBR
30P	LTCS / DSS LT	-50 to 300 (-46 to 150)	CL 150 - CL 600	Sour ^j	ASTM A350-LF2-1 / ASTM A352-LCC	ASTM A182-F51 / ASTM A276 UNS S31803	ASTM A182-F51 / ASTM A276 UNS S31803 / ASTM A995-4A	ASTM A182-F51 / ASTM A276 UNS S31803 / ASTM A995-4A	ASTM A320-L7M and A194-7M	UNS N06625 / UNS R30003 / UNS N10276	RPTFE	PTFE Lip Seal + Elgiloy Spring + Anti-Collapse / V-Packing (Chevron)

Table N.2 (continued)

General					Materials ^{a, o, r}							
IOGP S-562 Material Class	Nominal Body and Trim Material	Temperature Range °F (°C)	ASME Pressure Rating	Service	Pressure-containing Parts Except Stem	Stem ^h	Ball	Seat Ring, and Other Wetted parts	Bolting ^q	Springs ^s	Seat Insert ^c	Primary Seals ^{d, e, f, g, k}
31P	LTCS / DSS LT	-50 to 300 (-46 to 150)	≥ CL 600	Sour ^j	ASTM A350-LF2-1 / ASTM A352-LCC	ASTM A182-F51 / ASTM A276 UNS S31803	[ASTM A182-F51 / ASTM A276 UNS S31803 / ASTM A995-4A] + ENP ^u	ASTM A182-F51 / ASTM A276 UNS S31803 / ASTM A995-4A	ASTM A320-L7M and A194-7M	UNS N06625 / UNS R30003 / UNS N10276	PEEK	PTFE Lip Seal + Elgiloy Spring + Anti-Collapse / V-Packing (Chevron)
40S	316 SS Sour	-20 to 300 (-29 to 150)	CL 150 - CL 600	Sour ^j	ASTM A182-F316/F316L / ASTM A351-CF3M/CF8M	ASTM A479 UNS S20910 (XM-19) / ASTM A182 FXM-19 / A479 316/ A182 F316	ASTM A182-F316/316L / ASTM A351-CF3M/CF8M	ASTM A182-F316/316L / ASTM A351-CF3M/CF8M	A193 B8M Class 1 / A194 8M / A194 8MA ^p	UNS N06625 / UNS R30003 / UNS N10276	RPTFE	FKM / HNBR
41S	316 SS Sour	-20 to 300 (-29 to 150)	≥ CL 600	Sour ^j	ASTM A182-F316/F316L / ASTM A351-CF3M/CF8M	ASTM A479 UNS S20910 (XM-19) / ASTM A182 FXM-19 / A479 316/ A182 F316	[ASTM A182-F316/316L / ASTM A351-CF3M/CF8M] + ENP ^u	ASTM A182-F316/316L / ASTM A351-CF3M/CF8M	A193 B8M Class 1 / A194 8M / A194 8MA ^p	UNS N06625 / UNS R30003 / UNS N10276	PEEK	FKM / HNBR
40X	316 SS Sour LT	-50 to 300 (-46 to 150)	CL 150 - CL 600	Sour ^j	ASTM A182-F316/F316L / ASTM A351-CF3M/CF8M	ASTM A479 UNS S20910 (XM-19) / ASTM A182 FXM-19 / A479 316/ A182 F316	ASTM A182-F316/316L / ASTM A351-CF3M/CF8M	ASTM A182-F316/316L / ASTM A351-CF3M/CF8M	A193 B8M Class 1 / A194 8M / A194 8MA ^p	UNS N06625 / UNS R30003 / UNS N10276	RPTFE	FKM LT/ HNBR
41X	316 SS Sour LT	-50 to 300 (-46 to 150)	≥ CL 600	Sour ^j	ASTM A182-F316/F316L / ASTM A351-CF3M/CF8M	ASTM A479 UNS S20910 (XM-19) / ASTM A182 FXM-19 / A479 316/ A182 F316	[ASTM A182-F316/316L / ASTM A351-CF3M/CF8M] + ENP ^u	ASTM A182-F316/316L / ASTM A351-CF3M/CF8M	A193 B8M Class 1 / A194 8M / A194 8MA ^p	UNS N06625 / UNS R30003 / UNS N10276	PEEK	FKM LT / HNBR
40P	316 SS Sour LT	-50 to 300 (-46 to 150)	CL 150 - CL 600	Sour ^j	ASTM A182-F316/F316L / ASTM A351-CF3M/CF8M	ASTM A479 UNS S20910 (XM-19) / ASTM A182 FXM-19 / A479 316/ A182 F316	ASTM A182-F316/316L / ASTM A351-CF3M/CF8M	ASTM A182-F316/316L / ASTM A351-CF3M/CF8M	A193 B8M Class 1 / A194 8M / A194 8MA ^p	UNS N06625 / UNS R30003 / UNS N10276	RPTFE	PTFE Lip Seal + Elgiloy Spring + Anti-Collapse / V-Packing (Chevron)
41P	316 SS Sour LT	-50 to 300 (-46 to 150)	≥ CL 600	Sour ^j	ASTM A182-F316/F316L / ASTM A351-CF3M/CF8M	ASTM A479 UNS S20910 (XM-19) / ASTM A182 FXM-19 / A479 316/ A182 F316	[ASTM A182-F316/316L / ASTM A351-CF3M/CF8M] + ENP ^u	ASTM A182-F316/316L / ASTM A351-CF3M/CF8M	A193 B8M Class 1 / A194 8M / A194 8MA ^p	UNS N06625 / UNS R30003 / UNS N10276	PEEK	PTFE Lip Seal + Elgiloy Spring + Anti-Collapse / V-Packing (Chevron)
50S	22 Cr Duplex Sour	-20 to 300 (-29 to 150)	CL 150 - CL 600	Sour ^j	ASTM A182-F51 / ASTM A995-4A	ASTM A182-F51 / ASTM A276 UNS S31803	ASTM A182-F51 / ASTM A276 UNS S31803 / ASTM A995-4A	ASTM A182-F51 / ASTM A276 UNS S31803 / ASTM A995-4A	A193 B8M Class 1 / A194 8M / A194 8MA ^p	UNS N06625 / UNS R30003 / UNS N10276	RPTFE	FKM / HNBR
51S	22 Cr Duplex Sour	-20 to 300 (-29 to 150)	≥ CL 600	Sour ^j	ASTM A182-F51 / ASTM A995-4A	ASTM A182-F51 / ASTM A276 UNS S31803	[ASTM A182-F51 / ASTM A276 UNS S31803 / ASTM A995-4A] + ENP ^u	ASTM A182-F51 / ASTM A276 UNS S31803 / ASTM A995-4A	A193 B8M Class 1 / A194 8M / A194 8MA ^p	UNS N06625 / UNS R30003 / UNS N10276	PEEK	FKM / HNBR
50X	22 Cr Duplex Sour LT	-50 to 300 (-46 to 150)	CL 150 - CL 600	Sour ^j	ASTM A182-F51 / ASTM A995-4A	ASTM A182-F51 / ASTM A276 UNS S31803	ASTM A182-F51 / ASTM A276 UNS S31803 / ASTM A995-4A	ASTM A182-F51 / ASTM A276 UNS S31803 / ASTM A995-4A	A193 B8M Class 1 / A194 8M / A194 8MA ^p	UNS N06625 / UNS R30003 / UNS N10276	RPTFE	FKM LT / HNBR

Table N.2 (continued)

General					Materials ^{a, o, r}							
IOGP S-562 Material Class	Nominal Body and Trim Material	Temperature Range °F (°C)	ASME Pressure Rating	Service	Pressure-containing Parts Except Stem	Stem ^h	Ball	Seat Ring, and Other Wetted parts	Bolting ^q	Springs ^s	Seat Insert ^c	Primary Seals ^{d, e, f, g, k}
51X	22 Cr Duplex Sour LT	-50 to 300 (-46 to 150)	≥ CL 600	Sour ^j	ASTM A182-F51 / ASTM A995-4A	ASTM A182-F51 / ASTM A276 UNS S31803	[ASTM A182-F51 / ASTM A276 UNS S31803 / ASTM A995-4A] + ENP ^u	ASTM A182-F51 / ASTM A276 UNS S31803 / ASTM A995-4A	A193 B8M Class 1 / A194 8M / A194 8MA ^p	UNS N06625 / UNS R30003 / UNS N10276	PEEK	FKM LT / HNBR
50P	22 Cr Duplex Sour LT	-50 to 300 (-46 to 150)	CL 150 - CL 600	Sour ^j	ASTM A182-F51 / ASTM A995-4A	ASTM A182-F51 / ASTM A276 UNS S31803	ASTM A182-F51 / ASTM A276 UNS S31803 / ASTM A995-4A	ASTM A182-F51 / ASTM A276 UNS S31803 / ASTM A995-4A	A193 B8M Class 1 / A194 8M / A194 8MA ^p	UNS N06625 / UNS R30003 / UNS N10276	RPTFE	PTFE Lip Seal + Elgiloy Spring + Anti-Collapse / V-Packing (Chevron)
51P	22 Cr Duplex Sour LT	-50 to 300 (-46 to 150)	≥ CL 600	Sour ^j	ASTM A182-F51 / ASTM A995-4A	ASTM A182-F51 / ASTM A276 UNS S31803	[ASTM A182-F51 / ASTM A276 UNS S31803 / ASTM A995-4A] + ENP ^u	ASTM A182-F51 / ASTM A276 UNS S31803 / ASTM A995-4A	A193 B8M Class 1 / A194 8M / A194 8MA ^p	UNS N06625 / UNS R30003 / UNS N10276	PEEK	PTFE Lip Seal + Elgiloy Spring + Anti-Collapse / V-Packing (Chevron)
60S	25 Cr Duplex Sour	-20 to 300 (-29 to 150)	CL 150 - CL 600	Sour ^j	ASTM A182-F53/F55 / ASTM A995-6A	ASTM A182-F53/F55 / ASTM A276 UNS S32750/S32760	ASTM A182-F53/F55 / ASTM A276 UNS S32750/S32760 / ASTM A995-6A	ASTM A182-F53/F55 / ASTM A276 UNS S32750/S32760 / ASTM A995-6A	A193 B8M Class 1 / A194 8M / A194 8MA ^p	UNS N06625 / UNS R30003 / UNS N10276	RPTFE	FKM / HNBR
61S	25 Cr Duplex Sour	-20 to 300 (-29 to 150)	≥ CL 600	Sour ^j	ASTM A182-F53/F55 / ASTM A995-6A	ASTM A182-F53/F55 / ASTM A276 UNS S32750/S32760	[ASTM A182-F53/F55 / ASTM A276 UNS S32750/S32760 / ASTM A995-6A] + ENP ^u	ASTM A182-F53/F55 / ASTM A276 UNS S32750/S32760 / ASTM A995-6A	A193 B8M Class 1 / A194 8M / A194 8MA ^p	UNS N06625 / UNS R30003 / UNS N10276	PEEK	FKM / HNBR
60X	25 Cr Duplex Sour LT	-50 to 300 (-46 to 150)	CL 150 - CL 600	Sour ^j	ASTM A182-F53/F55 / ASTM A995-6A	ASTM A182-F53/F55 / ASTM A276 UNS S32750/S32760	ASTM A182-F53/F55 / ASTM A276 UNS S32750/S32760 / ASTM A995-6A	ASTM A182-F53/F55 / ASTM A276 UNS S32750/S32760 / ASTM A995-6A	A193 B8M Class 1 / A194 8M / A194 8MA ^p	UNS N06625 / UNS R30003 / UNS N10276	RPTFE	FKM LT / HNBR
61X	25 Cr Duplex Sour LT	-50 to 300 (-46 to 150)	≥ CL 600	Sour ^j	ASTM A182-F53/F55 / ASTM A995-6A	ASTM A182-F53/F55 / ASTM A276 UNS S32750/S32760	[ASTM A182-F53/F55 / ASTM A276 UNS S32750/S32760 / ASTM A995-6A] + ENP ^u	ASTM A182-F53/F55 / ASTM A276 UNS S32750/S32760 / ASTM A995-6A	A193 B8M Class 1 / A194 8M / A194 8MA ^p	UNS N06625 / UNS R30003 / UNS N10276	PEEK	FKM LT / HNBR
60P	25 Cr Duplex Sour LT	-50 to 300 (-46 to 150)	CL 150 - CL 600	Sour ^j	ASTM A182-F53/F55 / ASTM A995-6A	ASTM A182-F53/F55 / ASTM A276 UNS S32750/S32760	ASTM A182-F53/F55 / ASTM A276 UNS S32750/S32760 / ASTM A995-6A	ASTM A182-F53/F55 / ASTM A276 UNS S32750/S32760 / ASTM A995-6A	A193 B8M Class 1 / A194 8M / A194 8MA ^p	UNS N06625 / UNS R30003 / UNS N10276	RPTFE	PTFE Lip Seal + Elgiloy Spring + Anti-Collapse / V-Packing (Chevron)
61P	25 Cr Duplex Sour LT	-50 to 300 (-46 to 150)	≥ CL 600	Sour ^j	ASTM A182-F53/F55 / ASTM A995-6A	ASTM A182-F53/F55 / ASTM A276 UNS S32750/S32760	[ASTM A182-F53/F55 / ASTM A276 UNS S32750/S32760 / ASTM A995-6A] + ENP ^u	ASTM A182-F53/F55 / ASTM A276 UNS S32750/S32760 / ASTM A995-6A	A193 B8M Class 1 / A194 8M / A194 8MA ^p	UNS N06625 / UNS R30003 / UNS N10276	PEEK	PTFE Lip Seal + Elgiloy Spring + Anti-Collapse / V-Packing (Chevron)

Table N.2 (continued)

General					Materials ^{a, o, r}							
IOGP S-562 Material Class	Nominal Body and Trim Material	Temperature Range °F (°C)	ASME Pressure Rating	Service	Pressure-containing Parts Except Stem	Stem ^h	Ball	Seat Ring, and Other Wetted parts	Bolting ^q	Springs ^s	Seat Insert ^c	Primary Seals ^{d, e, f, g, k}
70S	Alloy 625 Clad NTCS ¹ / Alloy 625 Sour [≥ NPS 4 (DN 100)]	-20 to 300 (-29 to 150)	CL 150 - CL 600	Sour ^j	Alloy 625 Weld Overlay ASTM A105N / ASTM A216-WCB / ASTM A216-WCC	ASTM B446 UNS N06625 / ASTM B564 UNS N06625 / ASTM B637 UNS N07718	Alloy 625 Weld Overlay ASTM A105N / ASTM A216-WCB / ASTM A216-WCC	ASTM B564 UNS N06625 / ASTM B637 UNS N07718	ASTM A320-L7M and A194-7M	UNS N06625 / UNS R30003 / UNS N10276	RPTFE	FKM / HNBR
71S	Alloy 625 Clad NTCS ¹ / Alloy 625 Sour [≥ NPS 4 (DN 100)]	-20 to 300 (-29 to 150)	≥ CL 600	Sour ^j	Alloy 625 Weld Overlay ASTM A105N / ASTM A216-WCB / ASTM A216-WCC	ASTM B446 UNS N06625 / ASTM B564 UNS N06625 / ASTM B637 UNS N07718	Alloy 625 Weld Overlay ASTM A105N / ASTM A216-WCB / ASTM A216-WCC	ASTM B564 UNS N06625 / ASTM B637 UNS N07718	ASTM A320-L7M and A194-7M	UNS N06625 / UNS R30003 / UNS N10276	PEEK	FKM / HNBR
70P	Alloy 625 Clad LTCS ¹ / Alloy 625 Sour LT [≥ NPS 4 (DN 100)]	-50 to 300 (-46 to 150)	CL 150 - CL 600	Sour ^j	Alloy 625 Weld Overlay ASTM A350-LF2-1/ ASTM A352-LCC	ASTM B446 UNS N06625 / ASTM B564 UNS N06625 / ASTM B637 UNS N07718	Alloy 625 Weld Overlay ASTM A350-LF2-1/ ASTM A352-LCC	ASTM B564 UNS N06625 / ASTM B637 UNS N07718	ASTM A320-L7M and A194-7M	UNS N06625 / UNS R30003 / UNS N10276	RPTFE	PTFE Lip Seal + Elgiloy Spring + Anti-Collapse / V-Packing (Chevron)
71P	Alloy 625 Clad LTCS ¹ / Alloy 625 Sour LT [≥ NPS 4 (DN 100)]	-50 to 300 (-46 to 150)	≥ CL 600	Sour ^j	Alloy 625 Weld Overlay ASTM A350-LF2-1/ ASTM A352-LCC	ASTM B446 UNS N06625 / ASTM B564 UNS N06625 / ASTM B637 UNS N07718	Alloy 625 Weld Overlay ASTM A350-LF2-1/ ASTM A352-LCC	ASTM B564 UNS N06625 / ASTM B637 UNS N07718	ASTM A320-L7M and A194-7M	UNS N06625 / UNS R30003 / UNS N10276	PEEK	PTFE Lip Seal + Elgiloy Spring + Anti-Collapse / V-Packing (Chevron)
72P	Alloy 625	-50 to 300 (-46 to 150)	CL 150 - CL 600	Sour ^j	ASTM B564 UNS N06625 / A494 CW-6MC	ASTM B446 UNS N06625 / ASTM B564 UNS N06625 / ASTM B637 UNS N07718	ASTM B446 UNS N06625 / ASTM B564 UNS N06625 / ASTM B637 UNS N07718 [†]	ASTM B446 UNS N06625 / ASTM B564 UNS N06625 / ASTM B637 UNS N07718	A193 B8M Class 1 / A194 8M / A194 8MA ^p / UNS N07718 to API 6ACRA (120K)	UNS N06625 / UNS R30003 / UNS N10276	RPTFE	PTFE Lip Seal + Elgiloy Spring + Anti-Collapse / V-Packing (Chevron)
73P	Alloy 625	-50 to 300 (-46 to 150)	≥ CL 600	Sour ^j	ASTM B564 UNS N06625 / A494 CW-6MC	ASTM B446 UNS N06625 / ASTM B564 UNS N06625 / ASTM B637 UNS N07718	ASTM B446 UNS N06625 / ASTM B564 UNS N06625 / ASTM B637 UNS N07718 [†]	ASTM B446 UNS N06625 / ASTM B564 UNS N06625 / ASTM B637 UNS N07718	A193 B8M Class 1 / A194 8M / A194 8MA ^p / UNS N07718 to API 6ACRA (120K)	UNS N06625 / UNS R30003 / UNS N10276	PEEK	PTFE Lip Seal + Elgiloy Spring + Anti-Collapse / V-Packing (Chevron)
80P	6Mo	-50 to 300 (-46 to 150)	CL 150 - CL 600	Sour ^j	ASTM A182 Grade F44 / ASTM A351 Grade CK3MCuN, CN3MN	ASTM A276-A479 UNS S31254 / ASTM A182 Grade F44	[ASTM A276-A479 UNS S31254 / ASTM A182 Grade F44] [†] + ENP ^u	ASTM A276-A479 UNS S31254 / ASTM A182 Grade F44	A193 B8M Class 1 / A194 8M / A194 8MA ^p / UNS N07718 to API 6ACRA (120K)	UNS N06625 / UNS R30003 / UNS N10276	RPTFE	PTFE Lip Seal + Elgiloy Spring + Anti-Collapse / V-Packing (Chevron)
81P	6Mo	-50 to 300 (-46 to 150)	≥ CL 600	Sour ^j	ASTM A182 Grade F44 / ASTM A351 Grade CK3MCuN, CN3MN	ASTM A276-A479 UNS S31254 / ASTM A182 Grade F44	[ASTM A276-A479 UNS S31254 / ASTM A182 Grade F44] [†] + ENP ^u	ASTM A276-A479 UNS S31254 / ASTM A182 Grade F44	A193 B8M Class 1 / A194 8M / A194 8MA ^p / UNS N07718 to API 6ACRA (120K)	UNS N06625 / UNS R30003 / UNS N10276	PEEK	PTFE Lip Seal + Elgiloy Spring + Anti-Collapse / V-Packing (Chevron)

Table N.2 (continued)

General					Materials ^{a, o, r}							
IOGP S-562 Material Class	Nominal Body and Trim Material	Temperature Range °F (°C)	ASME Pressure Rating	Service	Pressure-containing Parts Except Stem	Stem ^h	Ball	Seat Ring, and Other Wetted parts	Bolting ^q	Springs ^s	Seat Insert ^c	Primary Seals ^{d, e, f, g, k}
Key for IOGP Material Class Basic Numbering 10 CS/ENP 20 CS/316 30 CS/DSS 40 316SS 50 Duplex SS 60 Super Duplex SS 70 Alloy 625/ Alloy 625 Cladded 80 6Mo Suffix N Sweet -20F to 300F L Sweet -50F to 300F S Sour -20F to 300F P Sour -50F to 300F Lip Seals X Sour -50F to 300F												
^a The following alternative materials are acceptable per table N.2. Other alternative materials shall be accepted by the purchaser if listed materials are not available or not suitable to meet design requirements. 1. LTCS material is acceptable alternative to NTCS. 2. DSS and SDSS materials are acceptable alternatives to 316 SS and 6Mo SS. 3. SDSS materials are acceptable alternative to DSS. 4. When trim 10N or trim 11N is specified and ENP is not practical, 410, 420 and DSS are acceptable alternatives. 5. Alloy 625 or 718 materials are acceptable alternatives to 6Mo for stem, ball and seat ring. ^b When lip seal is offered as an alternative, sealing surfaces shall have weld overlay applied with corrosion-resistant material specified by the purchaser (see 5.15.2). ^c Soft-seat material and design shall be compatible with the MAWP at the specified temperature range. Alternative soft-seat materials shall be proposed if materials are inadequate for MAWP or not chemically compatible with the process fluids at the specified temperature range (see 5.14). ^d Chemical compatibility might vary depending on seal grade. The manufacturer shall confirm compatibility of seals material for specified service and shall specify seal grade. ^e Additional fire-safe seal shall be provided when needed to conform with fire testing certificates.												

Table N.2 (continued)

General					Materials ^{a, o, r}							
IOGP S-562 Material Class	Nominal Body and Trim Material	Temperature Range °F (°C)	ASME Pressure Rating	Service	Pressure-containing Parts Except Stem	Stem ^h	Ball	Seat Ring, and Other Wetted parts	Bolting ^q	Springs ^s	Seat Insert ^c	Primary Seals ^{d, e, f, g, k}
^f Lip seals are acceptable alternative when accepted by purchaser if no elastomeric seals are suitable for service. ^g For temperatures below -20 °F (-29 °C), elastomeric O-rings shall be only permitted when qualified in accordance with purchaser requirements (see K.22). ^h Cast material is not acceptable for stem. ⁱ Ball shall be electroless nickel coated (ENP) in accordance with IOGP S-563:2021, EDS IH004. ^j For materials in sour service, see 6.6. ^k Elastomers shall be RGD resistant (AED) for valves CL600 and above. ^l Alloy 625 solid material is acceptable alternative to alloy 625 weld overlaid NTCS/LTCS. ^m LTCS material shall be ASTM A350 LF2-1, A352 LCC, A350 LF6-1 or A350 LF6-2. ⁿ NTCS material shall be ASTM A105, ASTM A216-WCB, ASTM A216-WCC, ASTM A694-F52, ASTM A694-F60 or ASTM A694-F65. ^o Bearing shall be PTFE lined 316 SS unless ball material is of a higher corrosion-resistance in which case the bearing material shall be equivalent to the ball as a minimum. ^p A193 B8M class 2 may be used when accepted by purchaser. B8M Class 2 is strain hardened with concern of chloride stress corrosion cracking at temperature higher than 122 °F (50 °C). ^q When bolting is used in an offshore or marine environment, alternative bolting materials may be specified. ^r Other alternative materials shall be accepted by the purchaser if listed materials are not available or not suitable to meet design requirements. ^s For sour service, when H2S partial pressure is specified as less than 14.5 psi (1 bar) UNS N07750 may be used when accepted by the purchaser. ^t Ball material ASTM A350-LF2-1 with Alloy 625 weld overlay may be used when accepted by the purchaser. ^u ENP shall be applied to the ball when PEEK seats used with ball made of austenitic stainless steel, duplex or 6Mo material. TCC is an acceptable alternative when specified by the purchaser.												

Add new Annex O

Annex O

(normative)

Load on Valves Designed to ASME BPVC, Section VIII

O.1 General

This annex provides bending moments and axial forces to be used for the design of valve bodies in accordance with L.31 and L.32 where the manufacturer has selected ASME BPVC, Section VIII as the design basis.

NOTE 1 Alternative loads and forces for specific applications can be specified.

ASME BPVC, Section VIII valves shall be designed using the three load cases listed in O.2.

Design of reduced bore valves shall be based on the end connector size.

EXAMPLE An NPS 6 (DN 150) × NPS 4 (DN 100) reduced bore valve is based on the bending moments and forces of an NPS 6 (DN 150) valve.

NOTE 2 The pipe outside diameter used for these calculations is in accordance with ASME B36.10M.

NOTE 3 Pipe material used for these calculations is in accordance with ASTM A106 Gr. B

NOTE 4 The pipe bore used for these calculations is based on the full bore sizes in API 6D.

NOTE 5 The pipe outside diameter for NPS 54 (DN 1350) is not covered by ASME B36.10M, therefore the pipe outside diameter for NPS 54 (DN 1350) is 54 in. (1371.6 mm) for these calculations.

Bending moment for pipe shall be calculated in accordance with Equation (3).

Add new Equation (3)

$$M = \frac{0.25 \times I \times SMYS}{OD \div 2} \quad (3)$$

where

M is the bending moment;

I is the moment of inertia $= \frac{\pi}{64} \times (OD^4 - ID^4)$;

OD is the pipe outside diameter;

$SMYS$ is the specified minimum yield strength of ASTM A106 Gr. B.

Axial force for pipe shall be calculated in accordance with Equation (4).

Add new Equation (4)

$$F = 0.25 \times SMYS \times A \quad (4)$$

where

F is the axial force;

A is the area $= \frac{\pi}{4} \times (OD^2 - ID^2)$.

O.2 Calculations for Load Cases

Calculations for the three load cases shall be performed at the rated pressures of the valves at ambient temperature.

The first calculation shall be performed for the bending moment.

The second calculation shall be performed for the axial force.

The third calculation shall be performed for 50 % of the bending moment, and 50 % of the axial force.

O.3 Acceptance Criteria

Stresses shall be within the limits of the design code.

Seal performance integrity shall be maintained, ensuring that valve functionality is not affected.

O.4 Bending Moment Values

Bending moment values shall be in accordance with Table O.1.

Add new Table O.1**Table O.1—Bending Moment**

NPS	DN	OD in. (mm)	Class 150 to 600		Class 900		Class 1500		Class 2500	
			Bore ID in. (mm)	Moment ft. lbf (Nm)	Bore ID in. (mm)	Moment ft. lbf (Nm)	Bore ID in. (mm)	Moment ft. lbf (Nm)	Bore ID in. (mm)	Moment ft. lbf (Nm)
2	50	2.375 (60.3)	1.94 (49)	532 (728)	1.94 (49)	532 (728)	1.94 (49)	532 (728)	1.69 (42)	713 (988)
2 ½	65	2.875 (73)	2.44 (62)	819 (1099)	2.44 (62)	819 (1099)	2.44 (62)	819 (1099)	2.06 (52)	1253 (1702)
3	80	3.5 (88.9)	2.94 (74)	1541 (2152)	2.94 (74)	1541 (2152)	2.94 (74)	1541 (2152)	2.44 (62)	2344 (3160)
4	100	4.5 (114.3)	3.94 (100)	2690 (3643)	3.94 (100)	2690 (3643)	3.94 (100)	2690 (3643)	3.44 (87)	4296 (5844)
6	150	6.625 (168.3)	5.94 (150)	7363 (10362)	5.94 (150)	7363 (10362)	5.69 (144)	9489 (13031)	5.19 (131)	12975 (17773)
8	200	8.625 (219.1)	7.94 (201)	12943 (18073)	7.94 (201)	12943 (18073)	7.56 (192)	18819 (25420)	7.06 (179)	25311 (34355)
10	250	10.75 (273)	9.94 (252)	23923 (32836)	9.94 (252)	23923 (32836)	9.44 (239)	36049 (49449)	8.81 (223)	48814 (66491)
12	300	12.75 (323.8)	11.94 (303)	34261 (46642)	11.94 (303)	34261 (46642)	11.31 (287)	56505 (76553)	10.44 (265)	81675 (110264)
14	350	14 (355.6)	13.19 (334)	41665 (58726)	12.69 (322)	63831 (86793)	12.44 (315)	73975 (101781)	11.5 (292)	107000 (144446)
16	400	16 (406.4)	15.19 (385)	55017 (76928)	14.69 (373)	84865 (114813)	14.19 (360)	111816 (151929)	13.13 (333)	160242 (217150)
18	450	18 (457)	17.19 (436)	70226 (96431)	16.69 (423)	108900 (149548)	16 (406)	156852 (211993)	14.75 (374)	229244 (310025)
20	500	20 (508)	19.19 (487)	87290 (119988)	18.56 (471)	147960 (201571)	17.88 (454)	206867 (279604)	16.5 (419)	307389 (414831)
22	550	22 (559)	21.19 (538)	106209 (146119)	20.56 (522)	180817 (246545)	19.69 (500)	273157 (370335)	-	-
24	600	24 (610)	23.19 (589)	126984 (174824)	22.44 (570)	233279 (317685)	21.5 (546)	352264 (478822)	-	-
26	650	26 (660)	24.94 (633)	192972 (260571)	24.31 (617)	296594 (400047)	23.38 (594)	435511 (582392)	-	-
28	700	28 (711)	26.94 (684)	224787 (303739)	26.19 (665)	368603 (496992)	25.25 (641)	532215 (718526)	-	-
30	750	30 (762)	28.94 (735)	259031 (350216)	28.06 (712)	453516 (619624)	27 (686)	664695 (894294)	-	-
32	800	32 (813)	30.69 (779)	361162 (497206)	29.94 (760)	548160 (748144)	28.75 (730)	817354 (1107800)	-	-
34	850	34 (864)	32.69 (830)	409203 (563640)	31.81 (808)	657837 (893287)	30.5 (775)	991612 (1339717)	-	-
36	900	36 (914)	34.44 (874)	542363 (737148)	33.69 (855)	778206 (1053643)	32.25 (819)	1188892 (1598076)	-	-
38	950	38 (965)	36.44 (925)	606384 (824582)	35.63 (904)	892022 (1216785)	-	-	-	-

Table O.1 (continued)

NPS	DN	OD in. (mm)	Class 150 to 600		Class 900		Class 1500		Class 2500	
			Bore ID in. (mm)	Moment ft. lbf (Nm)	Bore ID in. (mm)	Moment ft. lbf (Nm)	Bore ID in. (mm)	Moment ft. lbf (Nm)	Bore ID in. (mm)	Moment ft. lbf (Nm)
40	1000	40 (1016)	38.44 (976)	673978 (916918)	37.63 (956)	993067 (1335062)	-	-	-	-
42	1050	42 (1067)	40.19 (1020)	856828 (1179892)	39.63 (1006)	1099540 (1501275)	-	-	-	-
48	1200	48 (1219)	45.94 (1166)	1274040 (1738092)	45.25 (1149)	1664226 (2247708)	-	-	-	-
54	1350	54 (1371.6)	51.69 (1312)	1808523 (2474614)	-	-	-	-	-	-
56	1400	56 (1422)	53.56 (1360)	2051965 (2766306)	-	-	-	-	-	-
60	1500	60 (1524)	57.44 (1458)	2474799 (3383886)	-	-	-	-	-	-
NOTE 1 The bending moment to be applied to the valve for these calculations is considered the moment that produces a stress value equal to 25 % SMYS in the outer fibers of the attached pipe. NOTE 2 The torsion in the pipe is not considered in these calculations.										

O.5 Axial Force Values

Axial force values shall be in accordance with Table O.2.

Add new Table O.2

Table O.2—Axial Force

NPS	DN	OD in. (mm)	Class 150 to 600		Class 900		Class 1500		Class 2500	
			Bore ID in. (mm)	Force lbf (N)	Bore ID in. (mm)	Force lbf (N)	Bore ID in. (mm)	Force lbf (N)	Bore ID in. (mm)	Force lbf (N)
2	50	2.375 (60.3)	1.94 (49)	12899 (58202)	1.94 (49)	12899 (58202)	1.94 (49)	12899 (58202)	1.69 (42)	19136 (88220)
2 ½	65	2.875 (73)	2.44 (62)	15889 (69979)	2.44 (62)	15889 (69979)	2.44 (62)	15889 (69979)	2.06 (52)	27640 (123700)
3	80	3.5 (88.9)	2.94 (74)	24784 (114380)	2.94 (74)	24784 (114380)	2.94 (74)	24784 (114380)	2.44 (62)	43270 (191286)
4	100	4.5 (114.3)	3.94 (100)	32481 (144411)	3.94 (100)	32481 (144411)	3.94 (100)	32481 (144411)	3.44 (87)	57839 (258969)
6	150	6.625 (168.3)	5.94 (150)	59149 (274491)	5.94 (150)	59149 (274491)	5.69 (144)	79131 (357618)	5.19 (131)	116515 (526086)
8	200	8.625 (219.1)	7.94 (201)	77979 (358321)	7.94 (201)	77979 (358321)	7.56 (192)	118457 (524998)	7.06 (179)	168693 (752277)
10	250	10.75 (273)	9.94 (252)	115171 (519541)	9.94 (252)	115171 (519541)	9.44 (239)	181763 (820333)	8.81 (223)	260777 (1168672)
12	300	12.75 (323.8)	11.94 (303)	137437 (614375)	11.94 (303)	137437 (614375)	11.31 (287)	238098 (1059224)	10.44 (265)	368138 (1631497)
14	350	14 (355.6)	13.19 (334)	151353 (701927)	12.69 (322)	240280 (1072887)	12.44 (315)	283455 (1283012)	11.5 (292)	438105 (1940909)
16	400	16 (406.4)	15.19 (385)	173619 (798088)	14.69 (373)	276291 (1226727)	14.19 (360)	375526 (1675771)	13.13 (333)	574540 (2557506)
18	450	18 (457)	17.19 (436)	195885 (883714)	16.69 (423)	312301 (1409947)	16 (406)	467312 (2074064)	14.75 (374)	731463 (3250276)
20	500	20 (508)	19.19 (487)	218152 (984654)	18.56 (471)	381590 (1706969)	17.88 (454)	551879 (2447992)	16.5 (419)	877928 (3887862)
22	550	22 (559)	21.19 (538)	240418 (1085593)	20.56 (522)	421174 (1884814)	19.69 (500)	661823 (2944348)	-	-
24	600	24 (610)	23.19 (589)	262684 (1186532)	22.44 (570)	497869 (2224248)	21.5 (546)	781717 (3486414)	-	-
26	650	26 (660)	24.94 (633)	371076 (1645142)	24.31 (617)	584304 (2587620)	23.38 (594)	889099 (3900162)	-	-
28	700	28 (711)	26.94 (684)	400214 (1774921)	26.19 (665)	674056 (2982754)	25.25 (641)	1006353 (4459805)	-	-
30	750	30 (762)	28.94 (735)	429352 (1904701)	28.06 (712)	774064 (3473031)	27 (686)	1175152 (5185890)	-	-

Table O.2 (continued)

NPS	DN	OD in. (mm)	Class 150 to 600		Class 900		Class 1500		Class 2500	
			Bore ID in. (mm)	Force lbf (N)	Bore ID in. (mm)	Force lbf (N)	Bore ID in. (mm)	Force lbf (N)	Bore ID in. (mm)	Force lbf (N)
32	800	32 (813)	30.69 (779)	564375 (2550722)	29.94 (760)	876872 (3928672)	28.75 (730)	1356837 (6035109)	-	-
34	850	34 (864)	32.69 (830)	600385 (2714148)	31.81 (808)	990453 (4412304)	30.5 (775)	1551407 (6874009)	-	-
36	900	36 (914)	34.44 (874)	755165 (3370301)	33.69 (855)	1106319 (4918368)	32.25 (819)	1758862 (7758242)	-	-
38	950	38 (965)	36.44 (925)	798048 (3562566)	35.63 (904)	1199226 (5372548)	-	-	-	-
40	1000	40 (1016)	38.44 (976)	840931 (3754832)	37.63 (956)	1264375 (5575699)	-	-	-	-
42	1050	42 (1067)	40.19 (1020)	1022340 (4622335)	39.63 (1006)	1329524 (5958957)	-	-	-	-
48	1200	48 (1219)	45.94 (1166)	1329890 (5956695)	45.25 (1149)	1762298 (7811256)	-	-	-	-
54	1350	54 (1371.6)	51.69 (1312)	1677814 (7537116)	-	-	-	-	-	-
56	1400	56 (1422)	53.56 (1360)	1837130 (8128117)	-	-	-	-	-	-
60	1500	60 (1524)	57.44 (1458)	2066112 (9274547)	-	-	-	-	-	-
NOTE The force to be applied to the valve is considered the axial force that produces a membrane stress value equal to 25 % SMYS in the pipe section.										

Bibliography

Add to start of Bibliography

The following documents are informatively cited in the text of this specification, API 6D, the PDS (IOGP S-562D) or the IRS (IOGP S-562L).

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IOGP Headquarters

Level 6, 3 Moorgate Place, London, EC2R 6EA, United Kingdom
T: +44 20 4570 6879
E: reception@iogp.org

IOGP Europe

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

www.iogp.org