

# Specification for Pressure Regulators

Public Review Draft

#### Revision history

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## 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).

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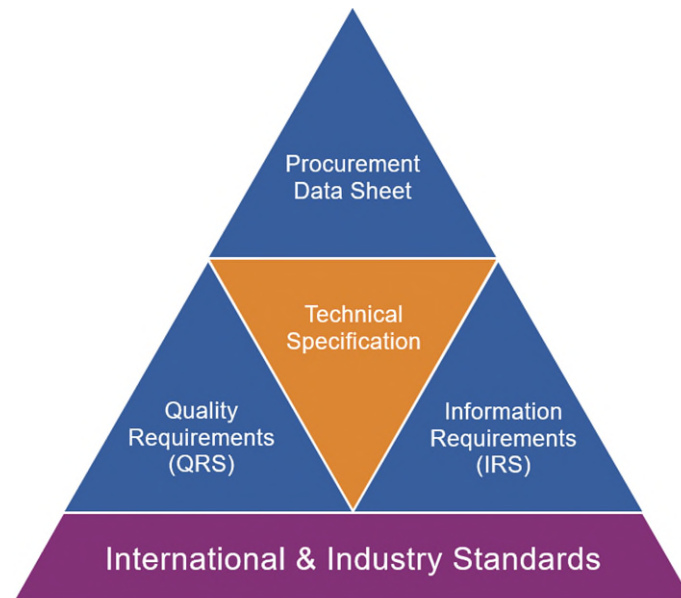
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## Introduction

The purpose of this specification is to define a minimum common set of requirements for the procurement of pressure regulators for application in the petroleum and natural gas industries.

This specification follows a common document structure comprising the four documents as shown below, which together with the purchase order define the overall technical specification for procurement.



### JIP33 Specification for Procurement Documents Technical Specification

This specification is to be applied in conjunction with the supporting procurement data sheet, information requirements specification (IRS) and quality requirements specification (QRS) as follows.

#### **IOGP S-739: Specification for Pressure Regulators**

This specification defines the technical requirements for the supply of the equipment.

#### **IOGP S-739D: Procurement Data Sheet for Pressure Regulators**

The procurement data sheet defines application specific requirements, attributes and options specified by the purchaser for the supply of equipment to the technical specification. The procurement data sheet may also include fields for supplier provided information attributes subject to purchaser's technical evaluation. Additional purchaser supplied documents may also be incorporated or referenced in the procurement data sheet to define scope and technical requirements for enquiry and purchase of the equipment.

#### **IOGP S-739L: Information Requirements for Pressure Regulators**

The IRS defines the information requirements, including contents, format, timing and purpose to be provided by the supplier. It may also define specific conditions which invoke information requirements.

**IOGP S-739Q: Quality Requirements for Pressure Regulators**

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 data sheet or in the purchase order.

The terminology used within this specification and the supporting procurement data sheet, IRS and QRS is in accordance with ISO/IEC Directives, Part 2.

The procurement data sheet and IRS are published as editable documents for the purchaser to specify application specific requirements. The specification and QRS are fixed documents.

The order of precedence (highest authority listed first) of the documents shall be:

- a) regulatory requirements;
- b) contract documentation (e.g. purchase order);
- c) purchaser defined requirements (procurement data sheet, IRS, QRS);
- d) this specification.

## 1 Scope

### 1.1

This specification defines the requirements for the design, sizing, materials, inspection, testing, marking, preparation for shipment and preservation for:

- self-acting pressure regulators; and
- pilot-operated pressure regulators.

NOTE Self-acting pressure regulators are also referred to as direct-acting pressure regulators.

### 1.2

This specification is applicable to pressure regulators in production facilities, transportation, refining, petrochemical, distribution and storage for:

- back pressure applications (controlling the upstream pressure);
- pressure reducing applications (controlling the downstream pressure);
- differential pressure applications; and
- tank blanketing applications (maintaining positive pressure on a tank).

### 1.3

This specification is applicable to pressure regulators in service with clean:

- hydrocarbon fluids;
- steam;
- water;
- inert gas; and
- instrument air.

### 1.4

This specification does not cover the following:

- pressure regulators in pneumatic and hydraulic circuits;
- pressure/vacuum relief valves (PV valves) in accordance with API Standard 2000.

## 2 Normative references

The following publications are referred to in this document, the procurement data sheet (S-739D) or the IRS (S-739L) in such a way that some or all of their content constitutes requirements of this specification. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ANSI/FCI 70-3, *Regulator Seat Leakage*



ANSI/ISA 75.01.01, *Industrial-Process Control Valves - Part 2-1: Flow capacity - Sizing equations for fluid flow under installed conditions*

ANSI/ISA 75.05.01, *Control Valve Terminology*

ANSI/ISA 75.17, *Control Valve Aerodynamic Noise Prediction*

ANSI/ISA 75.19.01, *Hydrostatic Testing of Control Valves*

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

ANSI/NACE MR0175/ISO 15156-1, *Petroleum, petrochemical, and natural gas industries — Materials for use in H<sub>2</sub>S-containing environments in oil and gas production — Part 1: General principles for selection of cracking-resistant materials*

ANSI/NACE MR0175/ISO 15156-2, *Petroleum, petrochemical, and natural gas industries — Materials for use in H<sub>2</sub>S-containing environments in oil and gas production — Part 2: Cracking-resistant carbon and low-alloy steels, and the use of cast irons*

ANSI/NACE MR0175/ISO 15156-3, *Petroleum, petrochemical, and natural gas industries — Materials for use in H<sub>2</sub>S-containing environments in oil and gas production — Part 3: Cracking-resistant CRAs (corrosion-resistant alloys) and other alloys*

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

ASME B16.5, *Pipe Flanges and Flanged Fittings NPS ½ Through NPS 24 Metric/Inch Standard*

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

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

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 A217/A217M, *Standard Specification for Steel Castings, Martensitic Stainless and Alloy, for Pressure-Containing Parts, Suitable for High-Temperature Service*

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

ASTM A320/A320M, *Standard Specification for Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service*

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 A453/A453M, *Standard Specification for High-Temperature Bolting, with Expansion Coefficients Comparable to Austenitic Stainless Steels*

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

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

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

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

ASTM A1014/A1014M, *Standard Specification for Precipitation-Hardening Bolting (UNS N07718) for High Temperature Service*

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

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*

EN 10204, *Metallic products – Types of inspection documents*

IEC 60534-1, *Industrial-process control valves – Part 1: Control valve terminology and general considerations*

IEC 60534-2-1, *Industrial-process control valves – Part 2-1: Flow capacity – Sizing equations for fluid flow under installed conditions*

IEC 60534-4, *Industrial-process control valves – Part 4: Inspection and routine testing*

IEC 60534-5:2004, *Industrial-process control valves – Part 5: Marking*

IEC 60534-8-3, *Industrial-process control valves – Part 8-3: Noise considerations – Control valve aerodynamic noise prediction method*

IEC 60534-8-4, *Industrial-process control valves – Part 8-4: Noise considerations – Prediction of noise generated by hydrodynamic flow*

IOGP S-563:2018, *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 Coating and Painting for Offshore, Marine, Coastal and Subsea Environments*

IOGP S-716, *Specification for Small Bore Tubing and Fittings*

ISO 10474, *Steel and steel products — Inspection documents*

ISO 12944-1, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 1: General introduction*

ISO 12944-2, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 2: Classification of environments*

ISO 12944-5, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 5: Protective paint systems*

ISO 12944-6, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 6: Laboratory performance test methods*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60534-1 or ISA 75.05.01 apply. ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org.obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

#### 3.1

##### **pressure-containing part**

part whose failure to function as intended results in a release of contained fluid into the environment

Note 1 to entry: Includes as a minimum the body, bonnet, stem, gland flange, bolting and body/bonnet gasket that pass through the pressure boundary.

#### 3.2

##### **pressure-controlling part**

part intended to control the flow of fluids

Note 1 to entry: Includes as a minimum the plug and seat.

### 4 General

#### 4.1

Pressure regulators with constant venting to atmosphere shall not be used for corrosive, hydrocarbon and toxic fluids.

#### 4.2

Set points of pressure regulators shall only be adjustable using a tool.

#### 4.3

Pressure regulator design and pressure-temperature ratings shall be in accordance with ASME B16.34 for the specified pressure class.

### 5 Design

#### 5.1 Valve body

Pressure regulator bodies shall be single piece or split body design.

## **5.2 Rating**

### **5.2.1**

Internal components of pressure-reducing regulators shall be rated for the design pressure of the upstream piping or provided with an overpressure protection device.

### **5.2.2**

The components of back pressure and differential pressure regulators shall be rated for the specified design pressure.

## **5.3 Flange dimensions**

Body flange dimensions shall be in accordance with ASME B16.5.

## **5.4 Flow direction**

The normal flow direction of pressure regulators shall be marked with an arrow as follows:

- permanently cast on the valve body;
- engraved on the valve body; or
- on a stainless steel plate riveted to the valve body.

## **5.5 Packing**

### **5.5.1**

The packing system shall be lubricant free.

### **5.5.2**

Packing for process design temperatures less than or equal to 200 °C (392 °F) shall be polytetrafluoroethylene based.

### **5.5.3**

Packing for process design temperatures greater than 200 °C (392 °F) shall be graphite based.

## **5.6 Tubing, fittings and instruments valves**

Pressure regulator pressure sensing tubing and fittings shall be in accordance with IOGP S-716.

## **5.7 Lifting**

Lifting points or a method for lifting shall be provided.

## **6 Sizing, noise and seat leakage**

### **6.1 Sizing**

#### **6.1.1**

Valve sizing shall be calculated in accordance with IEC 60534-2-1 or ISA RP75.01.01.

#### **6.1.2**

When pipe reducers or pipe fittings are used at the valve inlet and outlet, capacity correction shall be included in the sizing calculation.

### **6.2 Noise**

#### **6.2.1**

Aerodynamic noise calculations for gas, steam or vapour shall be performed in accordance with IEC 60534-8-3 or ISA 75.17.

#### **6.2.2**

Hydrodynamic noise calculations for liquids shall be performed in accordance with IEC 60534-8-4.

### **6.3 Seat leakage**

Seat leakage tests shall be performed in accordance with IEC 60534-4 or ANSI/FCI 70-3 for the specified leakage class.

## **7 Performance requirements**

### **7.1**

Self-acting pressure regulator droop shall be within 10 % of the set pressure at maximum flow.

NOTE Droop is also referred to as proportional band or offset.

### **7.2**

Pilot-operated pressure regulator droop shall be within 5 % of the set pressure at maximum flow.

## **8 Material requirements**

### **8.1 General**

#### **8.1.1**

Material selection shall be based on the specified service and pressure-temperature envelope.

#### **8.1.2**

Materials for pressure-containing parts including valve body, bonnet, gasket, bolting and those parts that become pressure bearing in the event of diaphragm or differential pressure seal failure shall meet or exceed the piping specification of the connected piping.

### 8.1.3

Pressure-containing and pressure-controlling part materials shall be selected from Table 1 through Table 7, according to the material selection of the pressure regulator.

### 8.1.4

Materials shall comply with the standards and IOGP S-563 material data sheets referenced in Table 1 through Table 7 for the listed components and any applicable additional requirements in this specification.

### 8.1.5

Free machining steel shall not be used.

### 8.1.6

Lifting lugs, supports, plugs and fittings welded directly to the valve body shall be of the same material grade as the body.

### 8.1.7

Metallic gaskets, pilot internals and process-wetted springs shall be minimum 316 stainless steel.

### 8.1.8

Asbestos and asbestos-containing materials shall not be used.

### 8.1.9

Cadmium plating shall not be used.

### 8.1.10

Mating surfaces of sliding elements and threaded components shall have different hardness values or an anti-galling coating.

## 8.2 Materials

### 8.2.1

Valves with the following basic materials shall have the materials of their components selected in accordance with Table 1 through Table 7:

- normal temperature carbon steel (NTCS);
- low temperature carbon steel (LTCS);
- austenitic stainless steel type 316;
- ferritic-austenitic stainless steel, type 22Cr duplex and 25Cr super duplex.

### 8.2.2

If Table 1 through Table 7 do not list an MDS for a particular material grade, the materials shall be supplied in accordance with the material standard without additional requirements.

### 8.2.3

Materials for actuator components shall conform to the requirements specified in Table 8.

**Table 1 — Normal temperature carbon steel – Sweet service, -29 °C (-20 °F) to 425 °C (800 °F)**

Material selection	MDS/EDS <sup>a</sup>	Pressure-containing parts			Pressure-controlling parts	
		Body/ bonnet	Stem	Bolting	Seat ring <sup>b</sup>	Plug, disk, cage <sup>b</sup>
ASTM A105	IC004	A <sup>c</sup>				
ASTM A216 WCB	IC006	A <sup>c</sup>				
ASTM A216 WCC	IC006	A <sup>c</sup>				
ASTM A182 F6A	IM104		A		A	A
ASTM A182 FXM-19	IS404		A			
ASTM A479 UNS S20910 XM-19	IS107		A			
ASTM A479 UNS S41000	IM107		A		A	A
ASTM A276 T410 / ASTM A276 T420	IM107/IM127		A		A	A
ASTM A217 CA 15	IM106				A	A
ASTM A564 Gr. 630 UNS S17400	IU607		A			
ASTM A705 Gr. 630 UNS S17400	IU604		A			
ASTM A182 F316/316L	IS104		A		A	A
ASTM A276 316/316L	IS107		A		A	A
ASTM A479 316/316L	IS107		A		A	A
ASTM A193 B7 / ASTM A194 2H	IX110/IX120			A		
ASTM A193 B7M / ASTM A194 2HM	IX110/IX120			A		
ASTM A320 L7 / ASTM A194 7	IX100/IX109			A		
ASTM A320 L7M / ASTM A194 7M	IX100/IX109			A		
<b>Key</b> A Acceptable alternative						
<sup>a</sup> MDS or EDS requirements in IOGP S-563 apply. <sup>b</sup> Trim material for erosive service shall be hard-faced in accordance with IOGP S-563 EDS IH001. <sup>c</sup> Corrosion allowance 3 mm.						

**Table 2 — Normal temperature carbon steel – Sour service, -29 °C (-20 °F) to 425 °C (800 °F)**

Material selection	MDS/EDS <sup>a</sup>	Pressure-containing parts			Pressure-controlling parts	
		Body/ bonnet	Stem	Bolting	Seat ring <sup>b</sup>	Plug, disk , cage <sup>b</sup>
ASTM A105	IC004S	A <sup>c</sup>			A	
ASTM A216 WCB	IC006S	A <sup>c</sup>			A	
ASTM A216 WCC	IC006S	A <sup>c</sup>			A	
ASTM A182 FXM-19	IS404SS		A			
ASTM A479 UNS S20910 XM-19	IS107S		A		A	A
ASTM A564 Gr. 630 UNS S17400	IU607S		A		A	A
ASTM A705 Gr. 630 UNS S17400	IU604S		A		A	A
ASTM A182 F316/316L	IS104S		A		A	A
ASTM A276 316/316L	IS107S		A		A	A
ASTM A479 316/316L	IS107S		A		A	A
ASTM A351 CF3M/CF8M	IS106S					A
ASTM A193 B7M / A194 2HM	IX110S / IX120S			A		
ASTM A320 L7M / A194 7M	IX100S / IX109S			A		
<b>Key</b> A Acceptable alternative  <sup>a</sup> MDS or EDS requirements in IOGP S-563 apply. <sup>b</sup> Trim material for erosive service shall be hard-faced in accordance with IOGP S-563, EDS IH001. <sup>c</sup> Corrosion allowance 3 mm.						



**Table 3 — Low temperature carbon steel – Sweet service, -46 °C (-50 °F) to 345 °C (650 °F)**

Material selection	MDS/EDS <sup>a</sup>	Pressure-containing parts			Pressure-controlling parts	
		Body/ bonnet	Stem	Bolting	Seat ring <sup>b</sup>	Plug, disk, cage <sup>b</sup>
ASTM A350 LF2 Class 1	IC104	A <sup>c</sup>			A	
ASTM A352 LCC	IC106	A <sup>c</sup>			A	
ASTM A182 FXM-19	IS404S		A			
ASTM A479 UNS S20910 XM-19	IS107		A		A	A
ASTM A182 F316/316L	IS104		A		A	A
ASTM A276 316/316L	IS107		A		A	A
ASTM A479 316/316L	IS107		A		A	A
ASTM A351 CF3M/CF8M	IS106					A
ASTM A182 F51	ID144		A			A
ASTM A276 UNS S31803	ID147		A			A
ASTM A995 Gr. 4A	ID146					A
ASTM B564 UNS N06625	IN104		A			
ASTM B637 UNS N07718	- <sup>d</sup>		A			
ASTM A320 L7 / A194 7	IX100 / IX109			A		
ASTM A320 L7M / A194 7M	IX100 / IX109			A		
<b>Key</b> A Acceptable alternative						
<sup>a</sup> MDS or EDS requirements in IOGP S-563 apply. <sup>b</sup> Trim material for erosive service shall be hard-faced in accordance with IOGP S-563, EDS IH001. <sup>c</sup> Corrosion allowance 3 mm. <sup>d</sup> UNS N07718 compliant with API 6ACRA.						

**Table 4 — Low temperature carbon steel – Sour service, -46 °C (-50 °F) to 345 °C (650 °F)**

Material selection	MDS/EDS <sup>a</sup>	Pressure-containing parts			Pressure-controlling parts	
		Body/ bonnet	Stem	Bolting	Seat ring <sup>b</sup>	Plug, disk, cage <sup>b</sup>
ASTM A350 LF2 Class 1	IC104S	A <sup>c</sup>			A	
ASTM A352 LCC	IC106S	A <sup>c</sup>			A	
ASTM A182 FXM-19	IS404S		A			
ASTM A479 UNS S20910 XM-19	IS107S		A		A	A
ASTM A182 F316/316L	IS104S		A		A	A
ASTM A276 316/316L	IS107S		A		A	A
ASTM A479 316/316L	IS107S		A		A	A
ASTM A351 CF3M/CF8M	IS106S					A
ASTM A182 F51	ID144S		A			A
ASTM A276 UNS S31803	ID147S		A			A
ASTM A995 Gr. 4A	ID146S					A
ASTM B564 UNS N06625	IN104S		A			
ASTM B637 UNS N07718	- <sup>d</sup>		A			
ASTM A320 L7M / A194 7M	IX100S / IX109S			A		
<b>Key</b> A Acceptable alternative						
<sup>a</sup> MDS or EDS requirements in IOGP S-563 apply. <sup>b</sup> Trim material for erosive service shall be hard-faced in accordance with IOGP S-563, EDS IH001. <sup>c</sup> Corrosion allowance 3 mm. <sup>d</sup> UNS N07718 compliant with API 6ACRA.						

**Table 5 — Austenitic stainless steel type 316, -198 °C (-325 °F) to 540 °C (1 000 °F)**

Material selection	MDS/EDS <sup>a</sup>	Pressure-containing parts			Pressure-controlling parts	
		Body /bonnet	Stem	Bolting	Seat ring <sup>b</sup>	Plug, disk, cage <sup>b</sup>
ASTM A182 FXM-19	IS404		A			
ASTM A479 UNS S20910 XM-19	IS107		A			
ASTM A182 F316/316L	IS104	A	A		A	A
ASTM A276 316/316L	IS107		A		A	A
ASTM A479 316/316L	IS107		A		A	A
ASTM A351 CF3M/CF8M	IS106	A				A
ASTM A193 B8M/B8MA / ASTM A194 8M/8MA	IS109			A		
<b>Key</b> A Acceptable alternative						
<sup>a</sup> MDS or EDS requirements in IOGP S-563 apply. <sup>b</sup> Trim material for erosive service shall be hard-faced in accordance with IOGP S-563, EDS IH001.						

**Table 6 — 22Cr DSS, -46 °C (-50 °F) to +260 °C (+500 °F)**

Material selection	MDS/EDS <sup>a</sup>	Pressure-containing parts			Pressure-controlling parts	
		Body /bonnet	Stem	Bolting	Seat ring <sup>b</sup>	Plug, disk, cage <sup>b</sup>
ASTM A182 F51	ID144	A	A		A	A
ASTM A995 Gr. 4A	ID146	A			A	A
ASTM A276 UNS S32750 / UNS32760	ID257		A		A	A
ASTM A193 B8MLCuNA / ASTM A194 GRADE 8MLCuNA	-			A		
ASTM A193 B8MLCuN-CLASS 1B / ASTM A194 GR 9CA	-			A		
ASTM A453 GR 660 Class D	IU100			A		
ASTM A1014 UNS N07718 / API 6ACRA (120K)	IN120S			A		
ASTM A1082 UNS S32750, S32760	ID260			A		
<b>Key</b> A Acceptable alternative						
<sup>a</sup> MDS or EDS requirements in IOGP S-563 apply. <sup>b</sup> Trim material for erosive service shall be hard-faced in accordance with IOGP S-563, EDS IH001.						

**Table 7 — 25Cr DSS, -46 °C (-50 °F) to +300 °C (+570 °F)**

Material selection	MDS/EDS <sup>a</sup>	Pressure-containing parts			Pressure-controlling parts	
		Body/ bonnet	Stem	Bolting	Seat ring <sup>b</sup>	Plug, disk, cage <sup>b</sup>
ASTM A182 F53/F55	ID244	A	A		A	A
ASTM A995 Gr. 6A	ID246	A			A	A
ASTM A276 UNS S32750 / UNS32760	ID257		A		A	A
ASTM A193 B8MLCuNA / ASTM A194 GRADE 8MLCuNA	-			A		
ASTM A193 B8MLCuN-CLASS 1B / ASTM A194 GR 9CA	-			A		
ASTM A453 GR 660 Class D	IU100			A		
ASTM A1014 UNS N07718 / API 6ACRA (120K)	IN120S			A		
ASTM A1082 UNS S32750, S32760	ID260			A		
<b>Key</b> A Acceptable alternative						
<sup>a</sup> MDS or EDS requirements in IOGP S-563 apply. <sup>b</sup> Trim material for erosive service shall be hard-faced in accordance with IOGP S-563, EDS IH001.						

**Table 8 — Material requirements for pneumatic actuator components**

Item	Material
Actuator bonnet/diaphragm case	Same as valve body/bonnet material or manufacturer standard material compatible with the specified process fluid.
Actuator diaphragm material	Manufacturer standard material compatible with the specified process fluid
Stroke adjustment components and shafts exposed to external environment	Onshore: manufacturer to specify Offshore and marine coastal: 316 stainless steel or better
Yoke	High tensile cast or ductile iron <sup>a</sup>
Actuator bolts/nuts/washers	316 stainless steel or low alloy steel with coating <sup>a</sup>
<sup>a</sup> The coating systems in accordance with Clause 10 shall be followed.	

### 8.3 Welding and post weld heat treatment

#### 8.3.1

Welding and post weld heat treatment of pressure-containing parts and attachment welding to pressure-containing parts shall be performed in accordance with IOGP S-705.

#### 8.3.2

Weld overlay and hardfacing shall comply with IOGP S-563:2018, IO001 and IH001.

## 8.4 Sour service

When sour service is specified, materials and fabrication shall comply with ISO 15156 /NACE MR0175 or ISO 17945 /NACE MR0103 and the additional metallurgical, manufacturing, testing and certification requirements stated in the applicable material data sheets and element data sheets in IOGP S-563.

## 9 Factory acceptance testing

### 9.1 Mandatory testing

#### 9.1.1 General

Factory acceptance testing shall be performed in accordance with Table 9.

**Table 9 — Factory acceptance test – Mandatory tests**

Test	Extent of testing for pressure classes up to and including ASME 300 class	Extent of testing for pressure classes above ASME 300 class	Reference (in this specification)
Visual Inspection	20 % (minimum 1 valve per model per size per pressure class per lot)	50 % (minimum 1 valve per model per size per pressure class per lot)	9.1.2
Dimensional check	20 % (minimum 1 valve per model per size per pressure class per lot)	50 % (minimum 1 valve per model per size per pressure class per lot)	9.1.3
Hydrostatic test	20 % (minimum 1 valve per model per size per pressure class per lot)	50 % (minimum 1 valve per model per size per pressure class per lot)	9.1.4
Set pressure/functional test	20 % (minimum 1 valve per model per size per pressure class per lot)	50 % (minimum 1 valve per model per size per pressure class per lot)	9.1.5
Positive material identification	20 % (minimum 1 valve per model per size per pressure class per lot)	50 % (minimum 1 valve per model per size per pressure class per lot)	9.1.6
Non destructive examination	See IOGP S-563		9.1.7

#### 9.1.2 Visual inspection

A visual inspection shall be performed to verify the following:

- make/model number;
- tube entry;
- tag plate and marking;
- flow direction;
- material grade for body/bonnet;
- coating and colour coding;
- flange size, rating and surface finish;
- pilot set pressure;

— supply of accessories.

### **9.1.3 Dimensional check**

A dimensional check shall be performed to verify the following:

- face-to-face or center-to-face dimensions;
- dimensional information for valves with an actuator;
- bolt circle diameter, number of bolts and flange thickness.

### **9.1.4 Hydrostatic testing**

#### **9.1.4.1**

A hydrostatic shell test shall be carried out for pressure-containing components in accordance with IEC 60534-4 or ISA 75.19.01.

#### **9.1.4.2**

The hydrostatic test medium shall be filtered, potable water with a chloride content not exceeding 250 mg/l.

#### **9.1.4.3**

For hydrostatic testing of austenitic and duplex stainless steels, the chloride content in the testing medium shall not exceed 50 mg/l.

#### **9.1.4.4**

On completion of hydrostatic testing, valves shall be drained of test fluids and dried.

### **9.1.5 Set pressure or functional testing**

Set pressure or functional testing shall be performed.

### **9.1.6 Positive material identification**

Positive material identification of pressure-containing, pressure-retaining and pressure-controlling parts shall be performed 100 % on alloy steel, stainless steel, nickel alloy and non-ferrous alloy valves.

### **9.1.7 Non destructive examination**

Non destructive examination for pressure-containing and trim parts shall be performed in accordance with IOGP S-563.

## **9.2 Supplementary testing - Seat leakage**

### **9.2.1**

Seat leakage testing shall be performed in accordance with IEC 60534-4 or ANSI/FCI 70-3.

### **9.2.2**

If water is used as a testing medium for seat leakage testing on austenitic and duplex stainless steel valves, the chloride content in the testing medium shall not exceed 50 mg/l.

## **10 Surface protection**

### **10.1**

Offshore and marine coastal coating systems shall be in accordance with IOGP S-715.

### **10.2**

Onshore and non-marine coating systems shall be selected in accordance with ISO 12944-5.

### **10.3**

Onshore and non-marine coating systems shall be qualified to ISO 12944-6.

### **10.4**

Coating under insulation shall be in accordance with IOGP S-715.

## **11 Marking, tagging and nameplate**

### **11.1**

Tag plates shall be marked with the pressure regulator tag number.

### **11.2**

Tag plates shall be 316L stainless steel.

### **11.3**

Tag plates shall be affixed with 316L stainless steel rivets or screws.

### **11.4**

Tag plate information shall be stamped or engraved.

### **11.5**

Markings shall be in accordance with IEC 60534-5:2004, Table 1, with item 19 mandatory.

## **12 Preparation for shipment and preservation**

### **12.1**

Inside and outside surfaces of valves and threaded surfaces of accessories shall be protected from atmospheric corrosion during shipment and storage.

### **12.2**

Open ports and connections shall be blanked off prior to packaging using covers or plugs made of hard plastic or a metal compatible with the port/flange material.

### **12.3**

The mounting surfaces of flanges shall be protected from damage during shipment and storage.

### **12.4**

Packing shall prevent moisture, water or foreign matter entering the valve body and components.

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## Bibliography

- [1] API Specification Q2, *Specification for Quality Management System Requirements for Service Supply Organizations for the Petroleum and Natural Gas Industries*
- [2] API Standard 2000, *Venting Atmospheric and Low-pressure Storage Tanks*
- [3] ASTM E415-14, *Standard Test Method for Analysis of Carbon and Low-Alloy Steel by Spark Atomic Emission Spectrometry*
- [4] ASTM E1086-14, *Standard Test Method for Analysis of Austenitic Stainless Steel by Spark Atomic Emission Spectrometry*
- [5] ISO 10005, *Quality management — Guidelines for quality plans*
- [6] ISO 17000, *Conformity assessment — Vocabulary and general principles*
- [7] ISO 17050, *Conformity assessment — Supplier's declaration of conformity — Part 1: General requirements*

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