



Exploration & Production

GENERAL SPECIFICATION

SUBSEA SYSTEMS

GS EP SPS 005

Subsea ball valves

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1. Scope

This Technical Specification defines the minimum requirements for the design and manufacture of subsea ball valves, which will be used for isolation and/or emergency shutdown service.

This document applies in addition to the Company general specification **GS EP PVV 142**.

2. Reference documents

The reference documents listed below form an integral part of this General Specification. Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the EFFECTIVE DATE of the CONTRACT.

Works specified shall be in accordance with this specification and the appropriate sections of the following codes and standards. Unless specified otherwise, the latest editions including amendments shall apply.

Any conflicting requirements between this specification and any other relevant document shall be reported to Company for decision.

In any case and notwithstanding the final decision of Company, the most stringent requirement is first meant to govern.

Standards

Reference	Title
ASTM A 193	Alloy Steel and Stainless Steel Bolting Materials for High Temperature Service
ASTM A 194	Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service
ASTM A 320	Standard Specification for Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service
ASTM A 352	Specification for Steel Castings, Ferritic and Martensitic, for Pressure-containing Parts suitable for Low-Temperature Service
ASTM A 370	Test Methods and Definitions for Mechanical testing of Steel Products
ASTM A 388	Recommended Practices for Ultrasonic Examination of Heavy Steel Forgings
ASTM A 609	Standard Practice for Castings, Carbon, Low-Alloy, and Martensitic Stainless Steel, Ultrasonic Examination Thereof
ASTM E 125	Standard Reference Photographs for Magnetic Particle Indications on Ferrous Castings
ASTM E 186	Standard Reference Radiographs for Heavy Walled (2-inch to 4½-inch) Steel Castings
ASTM E 280	Standard Reference Radiographs for Heavy Walled (4½-inch to 12-inch) Steel Castings
ASTM E 428	Standard Practice for Fabrication and Control of Metal, Other than Aluminum, Reference Blocks Used in Ultrasonic Testing



Reference	Title
ASTM E 446	Standard Reference Radiographs for Steel Castings up to 2-inch Thickness
BS 427	Resilient Floor Coverings - Determination of the Side Length, Squareness and Straightness of Tiles
BS 1133 Part 6	Temporary Protection of Metal Surfaces Against Corrosion (During Transport and Storage)
BS 1503	Specification for Steel Forgings for Pressure Purposes
BS 1504	Specification for Steel Castings for Pressure Purposes
BS 1706	Specification for Electroplated Coatings of Cadmium and Zinc on Iron and Steel
BS 3382	Cadmium plating of Threaded Fittings
BS 4515 + AMD 5810	Process of Welding of Steel Pipelines on Land and Offshore
BS 4870	Approval Testing of Welding Procedures
BS 4882	Bolting for Flanges and pressure containing purposes
BS 5750	Quality Systems
BS 6208	Methods for Ultrasonic Testing and for Specifying Quality Levels of Ferritic Steel Castings
EN 10204	Metallic products - Type of inspection documents
MSS SP 25	Standard Marking System for Valves, Fittings, Flanges and Unions
MSS SP 55	Quality Standards for Steel Casting for valves, Flanges, and Fittings and Other Piping Components - Visual Inspection
ISO R 85	Bend Testing
ISO R 148	Beam Impact Testing (V-notch)
ISO 2604	Specification for Carbon and Carbon Manganese Steels for Pressure Vessels
ISO 4406	Hydraulic fluid power - Fluids - Methods for coding the level of contamination by solid particles
ISO 6892	Tensile Testing
ISO 10423	Petroleum and natural gas industries - Drilling and production equipment - Wellhead and Christmas Tree Equipment
ISO 13628-4	Petroleum and Natural Gas Industries - Design and Operation of Subsea Production Systems - Part 4: Subsea Wellhead and Tree Equipment



Reference	Title
ISO 13628-8	Petroleum and Natural Gas Industries - Design and Operation of Subsea Production Systems - Part 8: Remotely Operated Vehicle (ROV) Interfaces on Subsea Production Systems
ISO 14723	Petroleum and natural gas industries - Pipeline transportation systems - Subsea pipeline valves

Professional Documents

Reference	Title
API 5L	Specification for Line pipe
API 6D	Specification for Pipeline Valves (Steel, Gate, Plug, Ball and Check Valves)
API 598	Valve Inspection and Test
ASNT-TC-1A	Personnel Qualifications and Certification in Non-Destructive Testing

Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
ASME B16.5	Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and other special Alloys
ASME B18.2.2	Bolts and Hexagonal Nuts
ASME B16.20	Ring Joint Gaskets and Grooves for Steel Pipe Flanges
ASME B16.34	Valve - Flanged, Threaded and Welding End
ASME B31.3	Chemical Plant and Petroleum Refinery Piping
ASME E428	Fabrication and Control of Steel Reference Blocks used in Ultrasonic Inspection
ASME Section V	Boiler and Pressure Vessel Code - Non-Destructive Examination



Reference	Title
ASME Section VIII Division 1	Boiler and Pressure Vessel Code - Pressure Vessels
ASME Section IX	Boiler and Pressure Vessel Code - Welding and Brazing Qualifications

Other documents

Reference	Title
Not applicable	

Total General Specifications

Reference	Title
GS EP COR 350	External protection of offshore and coastal structures and equipment by painting
GS EP PVV 142	Valves
GS EP PVV 611	Welding of pressure containing piping and equipment
GS EP PVV 613	Valves materials requirements for use in sour service
GS EP PVV 614	Welding of duplex and superduplex stainless steel
GS EP SPS 001	Design philosophy and requirements for Subsea Stations
GS EP SPS 002	Design of subsea structures
GS EP SPS 009	Corrosion protection of subsea stations
GS EP SPS 010	Preservation requirements for subsea package
GS EP SPS 011	Mechanical completion of subsea stations
GS EP SPS 024	Subsea mechanical quarter turn actuator (manually operated gearbox)
GS EP SPS 025	Subsea hydraulic spring return quarter turn actuator
GS EP SPS 029	Metallic Materials for Subsea Production Facilities

3. Valve operational requirements**3.1 Preliminary**

The ball valves covered by this specification comprise the following principal components:

- Valve assembly
- Seals



- External Connections/Body Penetrations
- ROV Interface
- Actuator.

3.2 General Requirements

General requirements for the valve are:

1. The design life for the valve assembly shall be as defined in the Project Basis for Design.
2. The rating working pressure is defined in the relevant valve data sheet as well as the maximum differential pressure the valve must face and actuator must be sized to operate.
3. The valves shall be full bore design with bi-directional flow and sealing.
4. The valve shall have butt weld pipe ends to fit the adjoining pipe system including any transition pieces to satisfy pipeline design code for WT ratio.
5. Valve, wetted part materials shall be compatible with all relevant fluids. Special consideration shall be given to the compatibility of coatings/linings applied to valve internals with all contained fluids during manufacture, testing, pre-commissioning and operation.
6. The valve shall be designed with due consideration to erosion and corrosion, and damage or blocking caused by possible sand or other particle deposition or hydrate formation. Special consideration shall be given to the possibility for sand accumulation or hydrate formation in valve cavity.
7. The internal profile of the valve shall prevent snagging of pig and minimise accumulation of debris and loose objects and the possible damages thereof.
8. The ball shall be trunnion mounted.
9. Mechanical actuator spindle and override spindle shall rotate clockwise to close, counter clockwise to open.
10. The valves shall be prepared for ROV operation and shall have visual position indicator showing full travel. The valves should be prepared for ROV operation by a standard valve intervention tool.
11. The valve/ROV tool interface shall comply with [ISO 13628-8](#) Class 4 Table 3, Section 12.9 or as otherwise defined by Company.
12. The override shall have direct drive with extended shaft and visual position indication on the receptacle showing full travel.
13. The external stem length and the top level of any additional stem extension device (if required) shall be given as input from the manifold and manifold structure design.
14. Valve performance shall not be affected by any combination of operational and design loads acting on it. Any performance limitations shall be identified and suitability of the valve assembly intended service shall be verified.
15. The valves shall be suitable for running all types of pigs and plugs in both directions if applicable.
16. For each valve type and size, a data sheet should be prepared in accordance with the requirements of Appendix 1.



3.3 Valve Assembly

3.3.1 General

All valve assemblies shall be designed for the field specific conditions defined in the Project Basis for Design.

The design shall be identified by design life, external and internal design pressures and temperatures, material compatibility with produced medium, injected chemicals such as methanol, inhibitors and other chemical substances relevant for the Project.

General design philosophies and requirements are defined in [GS EP SPS 001](#).

3.3.2 Design Requirements

The design requirements defined shall be implemented in the valve design.

1. The design of the valves shall be in accordance with the requirements contained within this specification and [ISO 14723](#).
2. The valve Manufacturer shall demonstrate by means of calculations or bend testing that a bending moment in all planes from pipeline or piping stressing of up to the bending moment necessary to achieve the specified minimum yield stress in the pipeline, shall not be detrimental to valve operation.

3.4 Sealing Requirements

The following sealing requirements shall apply:

1. The seat ring shall be single piece with simple piston effect.
2. Seals between ball and seat rings shall be of metal to metal type.
3. The stem seal shall as a minimum consist of two separate sealing systems. The primary system shall be of metal to metal seal technology. The seal area for the metal stem shall be Tungsten Carbide hard-faced unless agreed otherwise by Company. Minimum carbide thickness shall be 100 μ . For the carbide application method, reference is made to [GS EP PVV 142](#).
4. Non metallic stem seal and seal between floating seats and body:
 - The sealing systems shall be compatible with the production and injection fluids as described in the Project Basis for Design, as well as with the external and internal pressures. The adequacy and suitability of the sealing systems shall be demonstrated, particularly in case of local gas decompression, through a thorough analysis and verification test programme for Company agreement.
 - No resilient/soft sealing materials shall be used in sub-sea valves. All seals shall be rather pressure energised, lip seal type as dynamic and soft metallic "O"-rings as static ones or as back up sealing systems to lip seals.
 - For qualification test requirements, reference is made to [GS EP SPS 001](#).
5. The stem seal shall be designed to prevent ingress of seawater at the design water depth with minimum internal pressure. The depth shall be defined as per requirements in the Project Basis for Design and minimum internal pressure is 0.05 bar.