



Exploration & Production

GENERAL SPECIFICATION

SUBSEA SYSTEMS

GS SPS 006

Service valves in subsea stations
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1. Scope

The purpose of this specification is to define the design and testing requirements of subsea service valves for use on subsea Stations.

The requirements are applicable to the following range of valves:

1. Valves for methanol and chemical service.

- Needle valves 0.5" - 2" for inhibitor, chemicals and methanol fluids
- 2" ball valves ANSI class 2500 (Higher pressure rating may be used if available from valve SUPPLIER)
- Spring loaded check valves 0.5" - 2"
- Small bore gate valves

2. Valves for use in hydraulic service

- Ball valves 0.5" - 2"
- Needle valves 0.5" - 2"
- Small bore gate valves.

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.

This technical specification is complementary to document **GS SPS 001** and **GS PVV 142**, and shall therefore be read in conjunction with said document and the other COMPANY specifications and standards identified herein.

The service valves shall comply with all relevant statutory requirements and specifications as well as all referenced ISO and other standards unless otherwise stated by COMPANY.

Standards

Applicable industry standards and specifications are defined in reference **GS SPS 001** and **GS PVV 142**. In addition, reference is made to the latest revision of the following codes and standards that are applicable to the valve:

Reference	Title
ANSI B 16.5	Pipe flanges and flanged fittings
ISO 14313	Specification for Pipeline Valves. Gate, Plug, Ball, and Check Valves (replaces API 6D)
ISO 10433	Specification for Wellhead Surface Safety Valves and underwater Safety Valves for Offshore Service (replaces API 14D)
ASME B 16.34	Valves - Flanged, Threaded, and welding End
ISO 13628	Subsea Wellhead and Christmas Tree Equipment

Reference	Title
ASME V	Boiler and Pressure Vessel Code Section V - Non Destructive Examination
ASME VIII	Boiler and Pressure Vessel Code Section VIII - Rules for Construction of Pressure Vessels - Division 1
ASME VIII	Boiler and Pressure Vessel Code Section VIII - Rules for Construction of Pressure Vessels - Division 2 - Alternative Rules
ASME B31.3	Chemical plant and petroleum refinery piping
ASTM A 193	Alloy Steel and Stainless Steel Bolting Materials for High-Temperature Service
EN 10204	Metallic Products - Types of Inspection Documents
NAS 1638	National Aerospace Standard for flushing and cleaning

Professional Documents

Reference	Title
NACE MR 01.75	Sulphide Stress Cracking – Resistant metallic materials for oilfield equipment

Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
Not applicable	

Other documents

Reference	Title
Not applicable	

Total General Specifications

Reference	Title
GS COR 100	Design of cathodic protection of offshore structures
GS PVV 142	Valves
GS SPS 001	Design philosophy and requirements for subsea stations



Reference	Title
GS SPS 002	Design of subsea structures
GS SPS 005	Subsea ball valves
GS SPS 006	Service Valves in subsea stations
GS SPS 009	Corrosion Protection of subsea equipment
GS SPS 010	Preservation requirements for subsea packages
GS SPS 011	Mechanical completion requirements for subsea equipment
GS SPS 023	Cleaning and flushing of hydraulic systems

3. Introduction

3.1 Abbreviations

HPU	Hydraulic Power Unit
HXT	Horizontal X-mas Tree
ICS	Intervention Control System
ROV	Remote Operated Vehicle
WH	Wellhead
WOCS	Workover Control System
XT	Dual Bore X-mas Tree

3.2 Responsibility

It is the responsibility of anyone who supplies equipment to this specification to ensure and document compliance with the requirements defined by this specification, and other relevant standards and statutory requirements.

Deviations from any of the requirements defined herein shall be treated as non-conformance in accordance with relevant COMPANY procedures.

4. Requirements

4.1 General

The ball valves covered by this specification consist of the following main components:

- Valve assembly
- ROV Interface facility.

The valve assembly consists of:

- Valve body
- Valve Stem w/Actuator (Hydraulic or manual ROV).

The valve assembly may be used in the following applications/configurations:

- Self contained with bonnets for in-line mounting in piping
- Self contained with bonnets where one side is mounted directly onto valve block (such as X-mas tree and similar)
- Integral for use as isolation valve on block penetrations.

4.2 Valve assembly

All valve assemblies shall be designed for the field specific conditions. The design shall be identified by design life, external and internal design pressures and temperatures as well as material compatibility with injected chemicals such as methanol, inhibitors and other chemical substances.

4.3 Design requirements

The valve design shall meet the following general requirements:

- The design of the valves shall be in accordance with the requirements defined in this specification and GS PVV 142, and the referred design code [ISO 10433](#) and API 6A, minimum PSL 3
- The assembly shall be designed for mounting on dedicated support bracket or directly onto ROV panel as required by the specific application
- The valve shall be mounted such that its functionality and sealing capability will not be affected by loads from the pipe or interfacing structure
- The valves shall be supplied with pipe ends adjusted to piping dimensions and prepared for butt weld connection or flanges as required for the specific application
- Valves bore/Flow direction shall be marked at the end of the stem/operating shaft for observation from ROV
- The ball, needle and gate valves shall have bi-directional performance
- The stem and bonnet seal systems shall be designed to prevent ingress of seawater at the design water depth and no internal pressure
- For each valve, one data sheet should be completed according to recommendations in Appendix 1.

4.4 Requirements for valves with methanol service or chemical injection products

Valves for use in methanol service shall meet the following requirements:

- All components of the valve assembly that may be exposed to methanol shall be qualified for 100% methanol service and other relevant injection fluids
- Galling of components in non lubricated service shall be prevented by selection of appropriate materials
- The seals between ball and seat and between stem and bonnet shall be metal to metal
- Check valves seals shall be metal-to-metal.

4.5 Requirements to ball valves for use in hydraulic service

- Seal between ball and seat rings shall be metal to metal, PEEK or similar material
- Primary dynamic seals in stem, bonnet and seat ring shall be PTFE based
- Seat ring to valve body seals shall be PTFE or PEEK based
- The seat ring for ball valves shall be single piece with simple piston effect
- The stem drive mechanism shall be designed for a torque/thrust force 2,5 times higher than the estimated torque to operate a new valve with full differential pressure under the most severe load conditions
- Bushing or bearing base material shall be corrosion resistant using PTFE coated AISI 316 or equivalent
- The weakest point of the valve actuation system shall be outside the stem seal area
- Clockwise turn of the valve spindle shall close the valve.

4.6 External connections/Body penetrations

Penetrations in valve body and bonnet shall as far as possible be avoided. Any port used for testing only shall be plugged and seal welded.

As applicable, flushing, vent and drain valves/ports shall be provided at the highest possible and at the lowest possible position of the valve, respectively.

4.7 ROV panel

Functional requirements for ROV panel installed valves are:

- For needle and ball valves with lever arm, particular attention shall be given to the design of the end stop arrangement
- Bending moments, reaction torque from end stops and impact from ROV shall not be transferred to the valve stem
- Valve position indicator shall be visually readable on the panel plate
- For valves with lever arm, the valve operation handle shall be dimensioned and designed with access and interface for operation by ROV manipulator
- The valve operating handle and end stops shall have the capacity to withstand max. torque output from the dedicated valve tooling
- Operating handles and position indicator arrangements at the ROV panel shall be designed to tolerate ROV impact corresponding to 1000 kg at the speed 0,5 m/s
- For valves operated by lever arm designed to fit with ROV manipulator arm, the valve assembly and valve mounting arrangement shall be designed to tolerate a torque of 400 Nm, a bending moment of minimum 1000 Nm and an axial force of 5000 N.

4.8 Material requirements

For general material requirements reference is made to ref. **GS SPS 001**.

Design limitation on materials

For submerged parts that may be exposed to cathodic protection¹, the following shall apply:

- For carbon and low alloy steels, SMYS shall not exceed **700 MPa** (725 MPa for bolts). The actual yield strength shall not exceed **950 MPa**. Alternatively, it may be verified that the actual hardness in base materials does not exceed **295 HB**.
- For carbon steel welds a limit of **300 HV5** applies.
- For stainless steels and non-ferrous materials, resistance against hydrogen embrittlement shall be controlled by the actual hardness of the material which shall be in accordance with **NACE MR 01.75**.

Carbon steel bolts shall be made as per grade B7M of **ASTM A 193**.

4.9 Coating

Surface preparation and protective coating shall be in accordance with document **GS SPS 009**.

4.10 Tests

4.10.1 Test program

The FAT (Factory Acceptance Testing) shall ensure and demonstrate that equipment and functions are in accordance with purchase order and contract requirements. The FAT program and procedure shall be prepared by the SUPPLIER and approved by COMPANY.

In addition to the requirements defined by the relevant standards, the valves shall undergo the following tests and verifications:

- Functional test to verify design requirements shall include measurement and recording of torque values required for opening and closing sequences. The torque required to open the valve with maximum differential pressure and close it with maximum operating pressure shall be recorded
- Verify correct interface with ROV manipulator/tool as required
- Verify correct function of stem system with end stops, position indicators, etc.

4.10.2 Qualification testing

New valve designs shall be qualified in accordance with ref. **GS SPS 001** and the program for prototype qualification testing defined in **ISO 10423** (API 6A), PR2 performance testing. In addition to the requirements defined in the relevant industry standards, the following requirements shall be adhered to:

- The operational torque at normal operation pressure and design differential pressure shall be recorded. For methanol valves all moving parts shall be completely free from lubrication oils, etc.
- A life endurance test of minimum 1200 cycles shall be performed
- The valve assembly (housing, bonnet and stem seal) shall be tested with external pressure corresponding to the specified water depth

¹ Material which would be coated shall be considered as exposed to cathodic protection unless it is demonstrated that the coating will remain tight for the specified design life.

- Where the design includes more than one seal, each seal shall be proven by individual tests
- Stepwise seat test shall be performed to demonstrate that the valve seals adequately with moderate pressure increments and at all pressure levels
- The qualification tests shall demonstrate that galling does not occur.

4.10.3 Mechanical completion

Reference is made to **GS SPS 011**.

4.11 Marking

4.11.1 Valve tagging

All valves shall be tagged with the tag number as stated on the requisition. This shall be clearly stamped on non-corrosive metal tag permanently attached to the valve.

4.11.2 Identification of materials and main characteristics

In addition to the standard marking required, the following information shall be marked by cold stamping on each valve:

- Type of valve (gate, ball, etc.)
- Specification and grade of body and trim materials
- Casting number
- Batch number
- Valve pressure class
- Diameter.

4.12 Packaging and preservation

Reference is made to **GS SPS 010**.

4.13 Operating environment

Reference is made to **GS SPS 001**.



Appendix 1 Recommended list of information on drawing and/or data sheets

Valve type
Pressure class
Service
Location/Water dept
Design lifetime
Nominal size
Inside bore
Design Code
Design standard
Design temperature, Flow Medium
Design temperature, Environment
Maximum differential pressure
Port design
Corrosion allowance
End connections
Process fluid
Body construction
Trim construction
Seat construction
Main seal type and material
Body/bonnet seal, types and material
Stem seal, types and material
Seawater ingress seal, type and material
Seat ring/body seal, type and material
Body material
Bonnet material
Stem material
Ball material
Seat material
External bolt, material
External nut, material
Vent and drain valves
Sealant injection valves
Surface protection
Type of operator
Valve tag number
Max. Shell test pressure
Max seat test pressure
Torque at max seat differential pressure
Maximum load from pipe (bending moment)