



Exploration & Production

GENERAL SPECIFICATION

SUBSEA SYSTEMS

GS EP SPS 001

Design philosophy and requirements for Subsea Stations

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1. Scope

The philosophy behind this document is to provide general and fundamental specifications, which form the Basis of Design of the system.

The purpose of this specification is to describe design philosophies and overall technical requirements for the functionality of Subsea Production and Injection Stations, including structures and manifolds, tie-in systems, control systems and X-Mas tree system.

This specification covers both permanently installed equipment and associated tools and temporary equipment required for offshore installation and commissioning of the systems as well as potential intervention work. The document is valid for all phases of a field development, i.e. engineering, procurement, construction, testing, installation, commissioning, operation and abandonment.

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 general specification and all other equipment specifications referenced herein are based on:

- Project specifications
- Company general specifications
- Industry standards

identified hereafter.

This specification is supplementary to the technical specifications identified hereafter, and shall therefore be used in conjunction with said documents and any other Company specifications identified therein.

The Subsea Station shall comply with all relevant industry standards such as ISO, API, and other referenced standards unless otherwise stated by Company.

In particular, [ISO 13628-1](#) shall be considered as a supplement to this specification.

In the event of any conflict between the reference documents, the following order of priority shall apply:

- Project specifications
- Company general specifications
- Industry standards.

Within the industry standards the following order of priority shall be observed:

- ISO
- API
- EN
- Others.



Note: The EU Pressure Equipment Directive (97/23/EC) becomes mandatory from 29 May 2002. This directive may require certain additional and new measures to be taken by the Supplier of pressurised equipment. Contractor shall identify any implications of the above.

Standards

Reference	Title
EN 10204	Metallic products types of inspection documents
ISO 4406	Hydraulic fluid power - Fluids - Methods for coding the level of contamination by solid particles
ISO 7531	Wire Rope Slings for General Purposes - Characteristics and Specifications
ISO 10423	Petroleum and natural gas industries - Drilling and production equipment - Wellhead and christmas tree equipment
ISO 13628-1	Petroleum and Natural Gas Industries - Design and Operation of Subsea Production Systems - Part 1: General Requirements and Recommendations
ISO 13628-4	Petroleum and Natural Gas Industries - Design and Operation of Subsea Production Systems - Part 4: Subsea Wellhead and Tree Equipment
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 13628-9	Petroleum and Natural Gas Industries - Design and Operation of Subsea Production Systems - Part 9: Remotely Operated Tool (ROT) Intervention Systems
ISO 15156-1	Petroleum and Gas Industries-Materials for Use in H ₂ S-containing environments in oil and gas production - Part 1: General principles for selection of cracking-resistant materials Including Technical Corrigenda and Technical Circulars
ISO 15156-2	Petroleum and Gas Industries-Materials for Use in H ₂ S-containing environments in oil and gas production - Part 2: Cracking-resistant carbon and low alloy steels, and cast irons Including Technical Corrigenda and Technical Circulars
ISO 15156-3	Petroleum and Gas Industries-Materials for Use in H ₂ S-containing environments in oil and gas production - Part 3: Cracking-resistant CRAs (corrosion resistant alloys) and other alloys including Technical Corrigenda and Technical Circulars



Professional Documents

Reference	Title
API 6A	Specification for Wellhead and Christmas Tree Equipment
API 8C	Drilling and Production Hoisting Equipment
API 16A	Specification for Drill Through Equipment
API 17G	Design and Operation of Completion/Workover Riser Systems
DNV	Rules for planning and execution of Marine Operations (RMO)
DNV 2.7-1	Certification Note No. 2.7-1 Offshore Containers Offshore Freight Containers
NORSOK U-001	Subsea Production Systems
NORSOK M-710	Qualification of non-metallic sealing materials and Manufacturers

Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
ASME B31.3	Process Piping
ASME B31.8	Gas Transmission and Distribution Piping Systems

Other documents

Reference	Title
Not applicable	

Total General Specifications

Reference	Title
GS EP COR 100	Design of cathodic protection of offshore structures
GS EP COR 350	External protection of offshore and coastal structures and equipment by painting
GS EP EXP 311	Plant integrity. Minimum inspection requirements
GS EP PLR 231	Induction bends for pipelines (mild, intermediate and severe sour service)

Reference	Title
GS EP PLR 232	Carbon steel flanges and branch outlet fittings and forged components for pipelines (mild, intermediate and severe sour service)
GS EP PLR 420	Site welding of carbon steel pipelines to API 1104 (sweet service)
GS EP PLR 421	Site welding of carbon steel pipelines to API 1104 (mild, intermediate and severe sour service)
GS EP PVV 142	Valves
GS EP PVV 611	Welding of pressure containing piping and equipment
GS EP PVV 614	Welding of duplex and superduplex stainless steel
GS EP SPS 002	Design of subsea structures
GS EP SPS 003	Foundation design considerations for subsea stations
GS EP SPS 004	Subsea Manifold System Gate Valves
GS EP SPS 005	Subsea ball valves
GS EP SPS 006	Service valves in subsea stations
GS EP SPS 007	Tie-in systems
GS EP SPS 008	Thermal insulation of subsea stations
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 012	Documentation requirements for subsea stations
GS EP SPS 015	Subsea gate valves and actuators in subsea Xmas-tree systems
GS EP SPS 016	Subsea insert chokes and associated running and retrieval tools
GS EP SPS 018	Subsea Multiphase Flow Meter
GS EP SPS 019	Subsea production control system
GS EP SPS 021	Subsea mateable electrical/optical connectors
GS EP SPS 022	Environmental testing of subsea electronics
GS EP SPS 023	Cleaning and Flushing of Hydraulic Systems
GS EP SPS 024	Subsea mechanical quarter turn actuator (manually operated gearbox)
GS EP SPS 025	Subsea hydraulic spring return quarter turn actuators
GS EP SPS 027	WROV spread minimum requirements
GS EP SPS 028	Obsolescence Management Plan for Subsea Production Control System
GS EP SPS 029	Metallic Materials for Subsea Production Facilities



Reference	Title
GS EP SPS 030	Observation ROV spread minimum requirements
GS EP STR 001	Weight monitoring and weighing of offshore units
GS EP STR 101	Design of offshore jacket and subsea structures
GS EP STR 201	Materials for offshore steel structures
GS EP STR 301	Fabrication of offshore steel structures
GS EP STR 401	Loadout, seafastening, transportation and installation of offshore structures
GS EP STR 404	Marine aspects for load-out, transportation and installation of offshore structures
GS EP FP 410	Subsea Wellhead and Guidance Systems
GS EP FP 411	Subsea Horizontal Christmas tree Systems
GS EP FP 412	Workover Subsea completion systems for Horizontal tree
GS EP FP 413	Subsea Vertical Dual Bore Christmas tree

3. Introduction

3.1 Definitions

Unit	Individual equipment item such as a X-Mas tree assembly, a subsea control module, etc.
System	Combination of Units serving certain functions in the subsea system, such as X-Mas tree System, Production Control System, etc.
Subsea Station	Combination of Systems forming a complete Subsea Production or Injection Station excluding the Xmas Tree. The defined battery limit is upstream the production wing or choke valve. For injection application, the battery limit is defined to be upstream the injection wing or choke valve.
Internal Interface	Interface between Units and Systems supplied by the same Contractor.
External Interface	Interface between Units or Systems supplied by one Contractor and equipment and services supplied by other Contractor(s).
Lifting gear	Any equipment with the primary function of connecting a Unit to a crane hook, including pad eyes permanently fixed to the load bearing structure of the Unit to be lifted. A transportation/test skid used for lifting shall be treated as lifting gear.

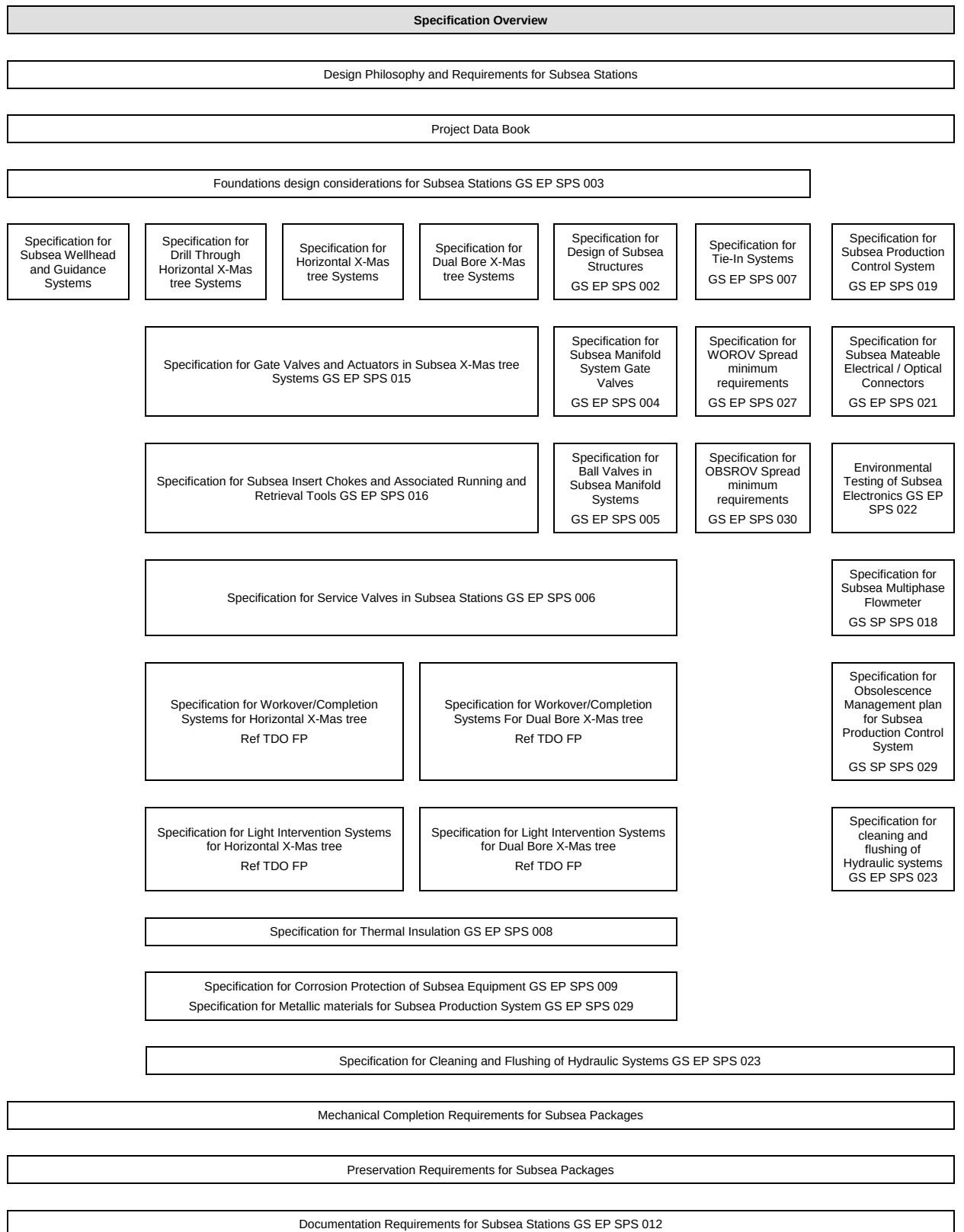


Figure 1 - Specification Overview



3.2 Abbreviations

The following abbreviations are used in this specification:

- API American Petroleum Institute
- BOP Blow-Out Preventer
- CCDS Cement and Cuttings Disposal System
- CP Cathodic Protection
- DTHT Drill Trough Horizontal Tree
- E&P Exploration and Production
- EFAT Extended FAT
- EN European Norm
- EQD Emergency Quick Disconnect
- FAT Factory Acceptance Test
- FPU Floating Production Unit
- FPSO Floating Production Storage and Offloading unit
- HCR High Collapse Resistant
- HFL Hydraulic Flying Leads
- HXT Horizontal X-Mas tree
- ISO International Standardisation Organisation
- LICS Light Intervention Control System
- MC Mechanical Completion
- MCM Manifold Control Module
- MDS Material Data Sheet
- MQC Multi quick connector
- MT Metric Tonnes
- PCS Production Control System
- PGB Permanent Guide Base
- PLM Pigging Loop Module
- ROV Remote Operated Vehicle
- SAM Subsea Accumulator Module
- SCM Subsea Control Module
- SDU Subsea Distribution Unit
- SIWHP Shut-In Wellhead Pressure
- SCSSV Sub Surface Safety Valve



- STT Surface Test Tree
- SSTT Subsea Test Tree
- WAG Water alternating gas
- WH Wellhead
- IWOCS Installation and Workover Completion System

3.3 Responsibility

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

Deviation from any of the requirements defined herein shall be declared and treated as a non-conformance.

4. System description

4.1 System overview

A complete subsea production or injection system consists of one or more subsea stations with flowlines and umbilicals connecting the stations to a process facility. The Subsea Station is defined to include the following systems:

- Wellhead System
- X-Mas tree System
- Subsea Production Control System including topside equipment
- Installation and Workover Completion System
- Tie-in System
- Structures (including manifolds).

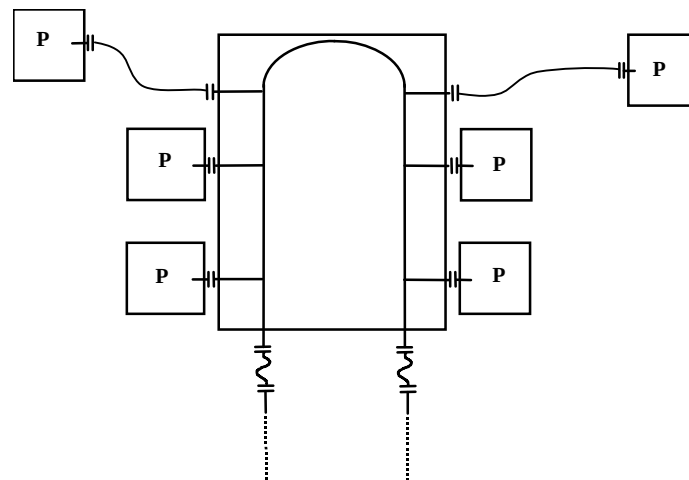
This document is valid for the Subsea Station, which is defined to include all Systems identified above.

Flowlines and Umbilicals are not part of the Subsea Station.

4.2 Configuration of the subsea station

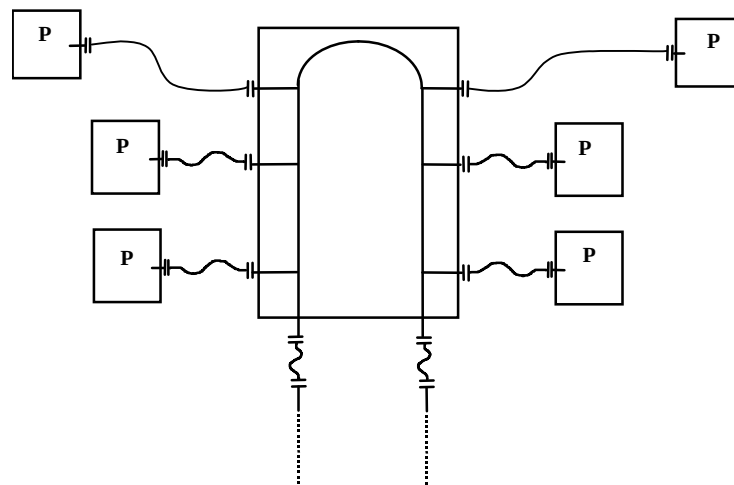
The systems covered by this specification shall be designed for use in any of the following development concepts:

- **Concept 1:** Multiwell Template with Production Manifold:
 - Concept 1A Integrated template/manifold
 - Concept 1B Modular template/manifold

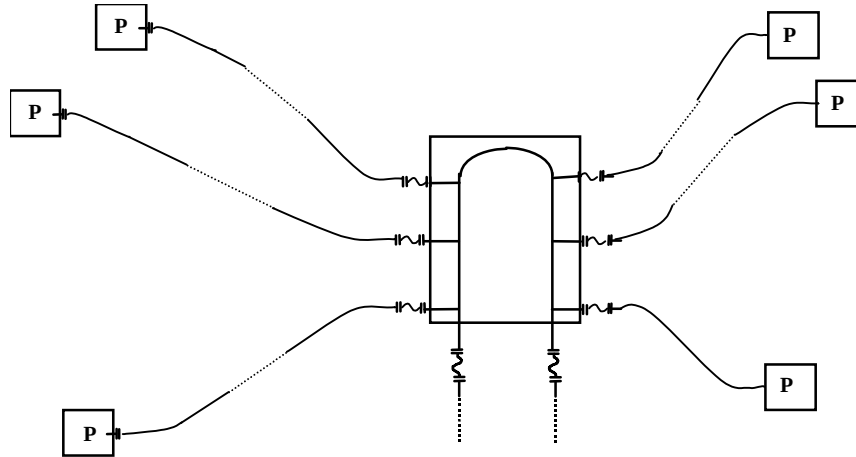


Typical 4-slot Template with two spare off template slots

- **Concept 2:** Individual Wells Connected to a Subsea Manifold Centre
 - Concept 2A Cluster configuration

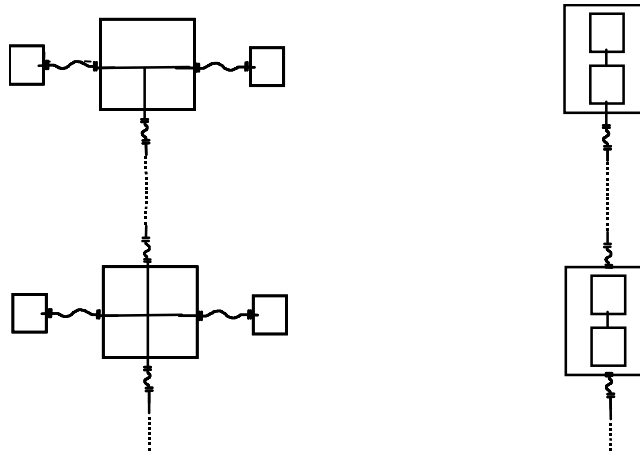


- Concept 2B Satellite configuration



Typical 4-Slot manifold configuration with provision for two spare slots

• Concept 3: 2-slot Structures (water or gas injection)



Two different versions of 2-slot structures