

GENERAL SPECIFICATION

ROTATING MACHINERY

GS EP MEC 027

**Rotating Machine Package Specification
Hydraulic Driven Submerged Pump
with Hydraulic Power Unit (HPU)
for Offshore applications**

06	12/2019	General update for digitalization
05	11/2018	Update
04	11/2017	Update
03	10/2016	Update
02	10/2015	Update
00	09/2013	First issue
Rev.	Date	Purpose of the revision

Owning entity: DSO/IP/TEC	Managing entity: DSO/IP/TEC/MTH
Other Approving entity(ies):	

General Specification		GS EP MEC 027
Rotating Machine Package Specification Hydraulic Driven Submerged Pump with Hydraulic Power Unit (HPU) for Offshore applications		
Rev.: 06	Effective date: 12/2019	Page: 2 of 56

Contents

1. Scope	4
1.1 Purpose	4
1.2 Application	4
1.3 General rules	4
2. Reference documents	5
3. Scope of supply and exclusions	9
3.1 Scope of supply	9
3.2 Exclusions	12
4. Basis of design	13
4.1 Particular specification requirements	13
4.2 Packaging requirements	13
5. Data Sheets	33
5.1 Submerged hydraulic driven pump	33
5.2 Submersible portable hydraulic driven pump	33
5.3 Submerged hydraulic driven ballast pump	33
5.4 HV and LV Electric motors	33
5.5 HPU noise	33
5.6 Weight	33
5.7 Other data sheets templates	33
6. Site conditions and utilities	34
6.1 Site conditions	34
6.2 Utilities	36
7. Tests	38
7.1 Factory tests	38
7.2 Pre-test activities	39
7.3 Post test inspections	40
7.4 Commissioning (at Contractor shipyard)	40
7.5 Site acceptance test	40

General Specification		GS EP MEC 027
Rotating Machine Package Specification Hydraulic Driven Submerged Pump with Hydraulic Power Unit (HPU) for Offshore applications		
Rev.: 06	Effective date: 12/2019	Page: 3 of 56

8. Spare parts and special tools	42
8.1 Spare parts	42
8.2 Special tools	42
9. Preparation for shipment	43
9.1 Preservation	43
9.2 Packing.....	44
10. Bibliography.....	46
11. Appendix 1: Definitions and abbreviations	49
12. Appendix 2: Baseplate installation	50
13. Appendix 3: Vendor Document Register (VDR)	51
14. Appendix 4: Deviations to the contractual documents	55
15. Appendix 5: Minimum inspection requirements	56

General Specification		GS EP MEC 027
Rotating Machine Package Specification Hydraulic Driven Submerged Pump with Hydraulic Power Unit (HPU) for Offshore applications		
Rev.: 06	Effective date: 12/2019	Page: 4 of 56

1. Scope

1.1 Purpose

This specification defines the minimum design, fabrication, inspection, and testing requirements for supply of hydraulically driven submerged pumping system, to be installed onboard a floating support. It is an exhaustive document detailing the scope of supply and the associated design rules requested by TOTAL E&P for the procurement of the system.

1.2 Application

This document applies to the design of submerged centrifugal pumps driven hydraulically, including cargo and hull tank vertical pumping systems. It excludes any other type of centrifugal pumps. This specification applies to offshore applications.

1.3 General rules

All deviations from this specification or the documents referred to herein shall be stated in writing in the Appendix 4 of this specification. In the absence of such a statement, it is assumed that the requirements of the specifications are met without exception.

Failure to meet the requirements of this specification and referenced documents shall be corrected at Vendor's cost.

Exceptions and deviations to the specifications shall be part of Vendor's proposal.

Where this specification, or any other project document, allows the Vendor to propose an "option", the Vendor shall clearly state the selected option in his bid.

When outsourced equipment are provided, the Vendor shall be responsible for the coordination of the Sub-Vendors and ensure the full compatibility of all the equipment.

Outsourced equipment shall be compatible in terms of safety, environment, operability, dimensions, weight, performance, control, noise and vibration behavior.

Components not mentioned in this specification that are necessary for the operation of the equipment or required by certifying agency, regulatory bodies or by law, shall be provided by the Vendor.

The present document remains a General Specification as long as the modifiable forms are not completed. It becomes the Project Specification once these modifiable forms are completed.

Then, the Project Specification shall be attributed a Project reference number with the associated Project front page.

General Specification		GS EP MEC 027
Rotating Machine Package Specification Hydraulic Driven Submerged Pump with Hydraulic Power Unit (HPU) for Offshore applications		
Rev.: 06	Effective date: 12/2019	Page: 5 of 56

If Project specificities require amendments to non modifiable parts of this specification or to the documents referred to herein, they shall be considered as deviations and stated in writing in the Appendix 4 of this specification.

This specification will then be issued in two steps:

- Issued “for inquiry”
- Issued “for purchase”.

The applicable documents shall be considered in the following order:

- Local regulations or European regulations in the absence of local regulations
- Classification Society Rules (if applicable)
- Frame agreement (if applicable)
- This completed specification and associated data sheets
- Referenced General Specifications
- Referenced Project specifications
- Codes and Standards.

2. Reference documents

The reference documents listed below form an integral part of this General Specification.

External Documents

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the effective date of this document.

Reference	Title
API STD 610	Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries
ASME BPVC Section VIII Div 1	ASME Boiler and Pressure Vessel Code (BPVC), Section VIII- Rules for Construction of Pressure Vessels - Division 1
Directive 1999/92/EC	Directive 1999/92/EC of the European Parliament and of the Council of 16 December 1999 on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres

Rotating Machine Package Specification
Hydraulic Driven Submerged Pump with Hydraulic Power Unit (HPU)
for Offshore applications

Rev.: 06

Effective date: 12/2019

Page: 6 of 56

Reference	Title
Directive 2014/34/EU	Directive 2014/34/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres
IEC 60079-10-1	Explosive atmospheres - Part 10-1 Classification of areas - Explosive gas atmospheres
ISO 10816-6	Mechanical Vibration. Evaluation of machine vibration by measurements on non-rotating parts - Part 6 Reciprocating machines with power ratings above 100 kW
ISO 780	Packaging - Distribution packaging - Graphical symbols for handling and storage of packages
ISO 9906	Rotodynamic pumps - Hydraulic performance acceptance tests - Grades 1, 2 and 3

Total General Specifications

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published in the applicable yearly collection.

The following Company specifications are fully applicable to all purchased equipment as listed in paragraph 3.1 completed by the technical details reported in paragraph 4 and taken into account accepted deviations as listed in Appendix 4. The second level General Specifications mentioned in each individual specification are not applicable if they are not listed in the below tables. The standards, professional documents, regulations and codes mentioned in each General Specification are applicable.

The following list may also be complemented with other specific Project detailed specifications which would include additional requirements, as applicable or deemed necessary by Company or Contractor.

Reference	Title
GS EP COR 350	External protection of offshore and coastal structures and equipment by painting
GS EP DEV 001	Asset Objects Tagging
GS EP ELE 011	Electrical Requirements for Packaged Units

Rotating Machine Package Specification
Hydraulic Driven Submerged Pump with Hydraulic Power Unit (HPU)
for Offshore applications

Rev.: 06

Effective date: 12/2019

Page: 7 of 56

Reference	Title
GS EP ELE 031	Design of Earthing and Bonding Systems for Offshore Installations
GS EP ELE 061	Minimum requirements for HV & LV cable sizing
GS EP ELE 079	Electrical apparatus for potentially explosive gas atmospheres
GS EP EXP 217	Spare Parts requirements for EPCs, Supplier, Manufacturer and MIE Team
GS EP INS 101	Instrumentation Design
GS EP INS 103	Instrument Database Management
GS EP INS 106	Instrument Installation
GS EP INS 109	Instrument cabinets
GS EP INS 110	Instrumentation for package units
GS EP INS 115	Instrument Earthing
GS EP INS 116	Instrument Cables
GS EP INS 135	Cybersecurity Requirements for Industrial Information Systems (SII)
GS EP INS 158	I/O Assignment Principles
GS EP INS 900	Instrument Hook-up Diagram
GS EP MEC 300	Noise and Vibration of Rotating Machine Packages
GS EP PVV 211	Design and fabrication of pressure vessels according to ASME VIII
GS EP PVV 411	Shell and tube heat exchangers
GS EP PVV 412	Plate heat exchangers
GS EP PVV 610	Welding of piping and pressure containing equipment

Rotating Machine Package Specification
Hydraulic Driven Submerged Pump with Hydraulic Power Unit (HPU)
for Offshore applications

Rev.: 06

Effective date: 12/2019

Page: 8 of 56

Reference	Title
GS EP STR 103	Design and fabrication of skids and equipment supporting structures

In case one of the previous General Specifications is completed with one or more Project specification(s), then these specifications (and their respective revision) shall be added to the following list.

Project Documents (to be completed by Company or Contractor)

	Designation	Rev	Reference
1	PID's (*)		
2	Layout (*)		
3	Project specification for electrical requirements for packaged units (*)		
4	Instrument tagging specification		
5	Instrument list database specification		

Note: All the documents identified by (*) will be available along with this specification for the issue for inquiry and for purchase.

Mechanical data sheets are listed in paragraph 5.

Rotating Machine Package Specification
Hydraulic Driven Submerged Pump with Hydraulic Power Unit (HPU)
for Offshore applications

Rev.: 06

Effective date: 12/2019

Page: 9 of 56

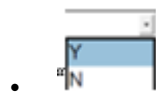
3. Scope of supply and exclusions

3.1 Scope of supply

The Vendor shall be responsible for the design, supply of materials, manufacture, assembly, supply of drawings and data, all Sub-Vendor co-ordination, testing, delivery and guarantees of the below components:

Note 1: The column “Required” indicates the level of requirement of each item, according to the below rule:

- “X” means that the item is a base case requirement.



- means that the item is an optional requirement specific to the project. YES if the option is selected or NO if the option is not selected.

Note 2: The column “Description” may offer alternative technical choices that shall be fixed prior to the issue “For inquiry” by ticking the appropriate mark box .

#	Item	Description	Required	Tag	Quantity
HYDRAULIC DRIVEN SUBMERGED PUMPING SYSTEM					
1	HYDRAULIC DRIVEN PUMPS				
1.1	Submerged hydraulic driven pump	As per data sheet in paragraph 5 and as referenced in paragraph 4.2.3.4.1 of this specification.	X	☐	☐
1.1.1	Deck trunk	Mild steel for welding to deck.	X		☐
1.1.2	Bolts	AISI 316L Stainless steel for connecting pump top-plate to deck trunk.	X		☐
1.1.3	Gasket	Between pump top-plate and deck trunk.	X		☐
1.1.4	Intermediate and bottom support ring	AISI 316L Stainless steel.	X		☐
1.1.5	Service valves hydraulic branch lines	AISI 316L Stainless steel.	X		☐
1.1.6	Exhaust trap	Stainless steel for ventilation / purging of cofferdam.	☐		☐
1.1.7	Cathodic protection	Parts exposed to tank.	☐		☐
1.1.8	Temperature sensor pocket	Installed all along pipestack.	☐		☐
1.2	Submerged hydraulic driven portable pump	As per data sheet in paragraph 5 and as referenced in paragraph 4.2.3.4.2 of this specification.	X	☐	☐
1.2.1	Adapter	AISI 316L Stainless steel.	X		☐
1.2.2	Connection valves with blind flanges	AISI 316L Stainless steel for connection to hydraulic pipe lines.	X		☐
1.2.3	Extension hoses	For interconnecting pump starter head and connection valves.	X		☐
1.2.4	Portable winch	Marine Aluminium alloy for handling of portable pump.	X		☐

**Rotating Machine Package Specification
Hydraulic Driven Submerged Pump with Hydraulic Power Unit (HPU)
for Offshore applications**

Rev.: 06

Effective date: 12/2019

Page: 10 of 56

#	Item	Description	Required	Tag	Quantity
1.2.5	Hoses	Nitrile / Neoprene hoses for connection to discharge lines.	☐		☐
1.3	Submerged hydraulic driven ballast pump	As per data sheet in paragraph 5 and as referenced in paragraph 4.2.3.4.3 of this specification.	X	☐	☐
1.3.1	Deck trunk	Mild steel for welding to deck.	X		☐
1.3.2	Bolts	AISI 316L Stainless steel for connecting pump top-plate to deck trunk.	X		☐
1.3.3	Gasket	Between pump top-plate and deck trunk.	X		☐
1.3.4	Intermediate support ring	AISI 316L Stainless steel.	X		☐
1.3.5	Service valves hydraulic branch lines	AISI 316L Stainless steel.	X		☐
2	HYDRAULIC POWER SYSTEM				
2.1	Hydraulic power unit	As referenced in paragraph 4.2.3.5.1 of this specification.	X	☐	☐
2.1.1	Temperature control valve	Motor operated temperature control valve for regulation of hydraulic oil temperature by open/ close cooling water inlet to hydraulic oil cooler.	X		☐
2.1.2	Temperature control by-pass valve	Motor operated temperature control valve for by-pass of hydraulic oil cooler by open/ close cooling water by-pass line.	X		☐
2.2	Hydraulic system tank with feed power packs	As per paragraph 4.2.3.5.3	X		☐
2.3	Hydraulic oil transmission equipment	As per paragraph 4.2.3.5.4	X		☐
2.4	Hydraulic oil transfer unit	As per paragraph 4.2.3.5.5.	X		☐
2.5	Fabricated steel common base plate	As per paragraph 4.2.2.1	x		☐
3	CONTROLS AND INSTRUMENTATION including but not limited to:				
3.1	Control Panel (UCP)	As per GS EP INS 110 and paragraph 4.2.4.1 of this specification. UCP is including PLC, panel mounted HMI.	X	☐	☐
3.2	ICSS interface	Communication cards, relays, signal convertors, etc. to interface with ICSS and support systems.	X		☐
3.3	Terminal junction boxes	All terminal junction boxes made of stainless steel AISI 316 located at skid edge as per GS EP INS 101 .	X		☐
3.4	Cable glands	As per GS EP INS 101 . Cable glands for departing multi-core cables, defined by Project and blinded off suitably for transport and storage. In case cable glands are supplied by other, gland plates to be pre-drilled and blinded off.	☐		☐
		As per GS EP INS 101 . For all other cables, junction boxes to be provided with cable gland plates and associated cable glands.	X		☐

**Rotating Machine Package Specification
Hydraulic Driven Submerged Pump with Hydraulic Power Unit (HPU)
for Offshore applications**

Rev.: 06

Effective date: 12/2019

Page: 11 of 56

#	Item	Description	Required	Tag	Quantity
3.5	Instrumentation cables	All instrument cables between instruments and skid mounted junction boxes / local gauge board indicator as per GS EP INS 116 .	X		1
3.6	Instrumentation Cable trays	All necessary cables trays with covers made of AISI 316L between instruments and skid mounted junction boxes as per GS EP INS 101 . Empty cable trays to be installed for the departing multi-core cables -supplied and installed by others- between the terminal junction boxes and the skid edge.	X		1
4	ELECTRICAL including but not limited to:				
4.1	Electrical cables trays	All required cables trays between all electrical consumers mounted on skid and the skid edge as per paragraph 4.2.5. Cable trays to be heavy duty perforated type and 316L stainless steel.	X		1
4.2	Electrical cable glands	LV electrical cable glands as per GS EP ELE 011 . Note: Any electrical cable gland for electrical interconnection within the package to be supplied by Vendor.	1		1
		HV electrical cable glands as per GS EP ELE 011 .	1		
4.3	Emergency stop push buttons	Local emergency stop push button for each HPU.	X		
5	OFFSKID EQUIPMENT (shipped loose)				
5.1	Remote control valve assembly	As per paragraph 4.2.3.5.6	X		1
5.2	Interconnecting Hydraulic Oil piping and fittings	High pressure system and low pressure system as per paragraph 4.2.3.6	X		1
5.3	Spare parts for commissioning and start-up	Detailed scope is given in the paragraph 8.	X		1
5.4	Capital spare parts	Detailed scope is given in the paragraph 8.	X		1
5.5	Special tools	If required for handling the hydraulic power unit according to Vendor's standard.	X		1
6	MISCELLANEOUS				
6.1	Baseplate anchors and shims	As per paragraph 4.2.2.1	X		1
6.2	Off skid equipment anchors and shims	All anchors and shims for all off skid equipment supplied by Vendor.	X		1
6.3	Grating arrangement	Hot dip galvanized carbon steel grating.	X		1
6.4	Documentation	Set of documents as per VDR in Appendix 3 of this specification.	X		1
6.5	Package 3D model review	Review of the package 3D models for maintenance areas review.	X		1
6.6	Maintenance laptop	Including software for UCP configuration.	1		1
6.7	Personal protection	As per paragraph 4.2.8.1	X		1
6.8	Painting and coating	As per paragraph 4.2.7	X		1
6.9	Battery limit flanges	All limit flanges as per Project piping classes equipped with blind flanges for transportation.	X		1

**Rotating Machine Package Specification
Hydraulic Driven Submerged Pump with Hydraulic Power Unit (HPU)
for Offshore applications**

Rev.: 06

Effective date: 12/2019

Page: 12 of 56

#	Item	Description	Required	Tag	Quantity
6.10	Package packing, marking and preservation	As per paragraph 9.	X		1
6.11	Earthing network	Earthing design and implementation as per GS EP ELE 031 and GS EP INS 115 .	X		1
6.12	Hydraulic oil system flushing kit	Kit made of all necessary flexible hoses for machinery bypass.	1		1
6.13	Lifting tools for the complete package	Consists of slings, shackles, and spreader bar as per paragraph 4.2.2.2 of this specification and as per GS EP STR 103 .	X		1 set(s)
6.14	Backup	Complete backup hard disk with application software, PLC program, HMI and any firmware prior to shipment.	X		1
6.15	Software	OEM CD/DVD for any software used with full licenses.	X		1
6.16	Specific climate considerations	☐ Tropicalization ☐ Winterization ☐ None	X		1
6.17	Tagging	Tagging as per GS EP DEV 001 .	X		
7	TESTS				
7.1	Factory Tests				
7.1.1	Submerged Pumps	As per paragraph 7.1.	X		1
7.1.2	Hydraulic power system	As per paragraph 7.1.	X		1
7.1.3	Noise and vibration test of hydraulic power units	As per paragraph 7.1.	X		1
7.1.4	UCP	UCP integration and communication test with ICSS at Sub-vendor premises as per paragraph 7.1 of this specification and as per GS EP INS 110 .	X		1
7.2	Site Acceptance Test				
7.2.1	Complete unit tests	As per paragraph 7.5.	X		1

3.2 Exclusions

The following equipment are not included in the scope of supply (supplied by other):

- Hydraulic oil storage tank
- Hydraulic oil drain tank
- Counter flanges, gaskets and bolting for connecting flanges at battery limits of Vendor's supply
- All piping outside the package except when specified here above
- Electric and instrument cables outside the package
- All earthing cables outside the package.

Rotating Machine Package Specification
Hydraulic Driven Submerged Pump with Hydraulic Power Unit (HPU)
for Offshore applications

Rev.: 06

Effective date: 12/2019

Page: 13 of 56

4. Basis of design

This paragraph details the technical specificities of the Project which are not covered in the Company General Specifications nor in the Project documents.

4.1 Particular specification requirements

Section left intentionally blank.

4.2 Packaging requirements

4.2.1 General considerations / Area classification

The complete package shall be designed for years of operation at least.

Environmental conditions for the equipment design are indicated in the paragraph 6.

[Directive 1999/92/EC](#) shall be applied.

[Directive 2014/34/EU](#) shall be applied as follows:

Installation zone (as per definition of IEC 60079-10-1)	Non-hazardous area []	Zone 2 []	Zone 1 []
Gas group / Temperature class	N/A	IIA / T3	
Electrical equipment	Electrical equipment selected in accordance with GS EP ELE 079 . Electrical material installed in an enclosure containing a fuel source to be designed for at least Zone 2 hazardous area, even if the enclosure is provided with dilution ventilation which renders it non-hazardous during normal operation.		
Instrumentation components	For installations located inside the European Union (EU countries) or in countries with no local regulations, instrumentation component to be supplied with certification ATEX ex II 2G. For installations located outside the European Union (EU countries), IECEx scheme may be mandatory applied (IEC Scheme for Certification relating to Equipment for use in Explosive Atmospheres).		
Internal combustion engines (for diesel engine driven generator packages)	No specific requirements.	<i>With pressurized enclosure:</i> Refer to package certification.	Not allowed.
		<i>Without pressurized enclosure:</i> Diesel generator packages not allowed in Zone 2.	
Internal combustion engines (for gas engine or gas turbine driven generator packages)	Refer to Zone 2	Refer to package certification.	Not allowed.
Internal combustion engines (for gas engine or gas turbine driven compressor packages)	Refer to Zone 2	Refer to package certification.	Not allowed.

Rotating Machine Package Specification
Hydraulic Driven Submerged Pump with Hydraulic Power Unit (HPU)
for Offshore applications

Rev.: 06

Effective date: 12/2019

Page: 14 of 56

Installation zone (as per definition of IEC 60079-10-1)	Non-hazardous area []	Zone 2 []	Zone 1 []
Internal combustion engines (for fire water pumps packages)	No specific requirements.	To be supplied with certification ATEX ex II 3G.	Not allowed.
Any rotating equipment package including auxiliaries	No specific requirements.	To be supplied with certification ATEX ex II 3G.	To be supplied with certification ATEX ex II 2G.
Declaration of ATEX conformity by	No specific requirements.	Vendor or Notified Body.	Notified Body.
Package CE marking by	Vendor or Notified Body.	Vendor or Notified Body.	Notified Body.

Package and all accessories shall bear their own marking, according to the mode of protection used.

4.2.2 Structural

4.2.2.1 Package base plate

HPU package base plate design shall conform to **GS EP STR 103** and be suitable under all operating conditions.

Package base plate shall be designed with either:

- A non slip decking steel plate covering the top of the base plate with a coaming plate all around with 2 drains points of 2" diameter minimum, or
- Grating covering the top of the baseplate and a steel plate continuously welded at the bottom of base plate recovering any oil spill and drain points of 2" diameter minimum.

All the equipment supported by the skid shall be contained within the skid projection footprint (meaning that no equipment overhung/projection outside the skid footprint is allowed).

The base plate is designed with multipoint supports with anti-vibration mountings, fitted with jacking bolts for leveling purpose.

Supporting shall comply with the requirements of **GS EP MEC 300** and **GS EP STR 103**.

Stainless steel shims pack (made of 1 x 15 mm, 1 x 5 mm, 1 x 3 mm, 2 x 1 mm shims) and 40 mm thickness carbon steel sole plates of all the packages as well as anchor bolts shall be provided by Vendor.

Contractor shall install and weld sole plates of all the packages in accordance with the Project specifications and Vendor requirements (number, size, location, material, strength and tightening torque).

The supporting structure shall be machined prior to welding the soleplates.



General Specification		GS EP MEC 027
Rotating Machine Package Specification Hydraulic Driven Submerged Pump with Hydraulic Power Unit (HPU) for Offshore applications		
Rev.: 06	Effective date: 12/2019	Page: 15 of 56

Refer to Appendix 2 for details.

All base plate drains interfaced between the Vendor and Contractor shall be routed to the skid edge and terminate by 2" ANSI 150 # flanges fitted with an isolating valve and a blind flange.

Drains shall be routed to plant hazardous open drain by Contractor.

4.2.2.2 Package lifting devices

Package lifting devices, such as lifting beams or spreader bars, slings, shackles, etc., shall be included in the Vendor scope of supply and designed, tested and certified by an approved authority in accordance with **GS EP STR 103**.

Lifting devices shall be load tested at 125% of the safe working load and certified by Third Party.

Visual inspections and NDT (dye penetrant and ultra sonic inspections) shall be performed after the load test.

Lifting tools shall be designed to lift the package both boxed and unboxed.

4.2.2.3 Weight control

Weight and center of gravity shall be defined for the different conditions: load-out, transport, installation, dry, operating.

A split of the components shall be provided for the main skid and items composing the package.

Percentages of contingencies and tolerances shall be indicated by the Vendor, subject to Company approval.

A final weighing shall be performed with calibrated equipment.

4.2.3 Mechanical

4.2.3.1 System design

The hydraulic driven submerged pumping system serves each tank with respect to offloading, transfer operations, crude oil washing and other pumping services. One hydraulic ring line system serving a hydraulic power system connected to submerged pumps located in each tank.

The system configuration and redundancy in terms of number of hydraulic power systems is based on evaluation of performance expectations.

There shall be two equal hydraulic power systems and two equal submerged pumps in each tank, one connected to each system.

General Specification		GS EP MEC 027
Rotating Machine Package Specification Hydraulic Driven Submerged Pump with Hydraulic Power Unit (HPU) for Offshore applications		
Rev.: 06	Effective date: 12/2019	Page: 16 of 56

The Hydraulic power units shall be installed in a 2x100% configuration and the submerged pumps in a 2x100% configuration.

Submerged pump capacities and duties are Project specific. Identically, the hydraulic power system oil supply depends on the number of simultaneous operating submerged pumps oil consumption, as further detailed in the paragraph 4.2.3.5.2.

4.2.3.2 Equipment design

For equipment or components for which design life is lower than the years of operation, the design shall include provisions for full replacement or component replacement with minimum disruption to plant operations.

The equipment shall be designed to keep the amount of maintenance at a lowest possible level.

The selected equipment or components shall be of field proven design and reliability for operation under equivalent operating conditions.

Prototype equipment and components are not permitted.

4.2.3.3 Equipment location

Submerged pump location in each tank takes into consideration the trim of the floating structure to remove residue in tank as far as possible for tank emptying and inspection.

Hydraulic Power Units shall be located in air ventilated and noise insulated rooms known as 'non hazardous area', installed in separate compartments so that maintenance can be carried out on one system without exposure of heat and noise from the other system.

Associated equipment to the HPU is installed by the Contractor in suitable location within the same room based on Vendor's recommended installation arrangement.

Vendor shall design the hydraulic system connections based on 2x100% hydraulic oil storage and drain tanks provided and installed by the Contractor.

Vendor shall advise tanks volumes.

Monorails and maintenance apparatus for components removal are provided by Contractor.

4.2.3.4 Hydraulic driven pumps

4.2.3.4.1 Submerged hydraulic driven pumps

4.2.3.4.1.1 Description

The pump shall be centrifugal, single stage, driven by hydraulic motor.

General Specification		GS EP MEC 027
Rotating Machine Package Specification Hydraulic Driven Submerged Pump with Hydraulic Power Unit (HPU) for Offshore applications		
Rev.: 06	Effective date: 12/2019	Page: 17 of 56

The pipe stack between the top plate and the pump head shall consist of the main pipe, purging pipes and a concentric hydraulic pipe.

The hydraulic high pressure pipe shall be located inside the low pressure return oil pipe.

The pump head shall be flanged to the pipe stack/casing and supported by a bottom support.

The pump shall have a built-in hydraulic motor connected to the impeller by a short independent shaft. Motor, shaft and bearings are lubricated and cooled by the hydraulic driving oil.

The hydraulic section of the pump shall be completely surrounded by a liquid filled cofferdam which completely segregates the hydraulic oil from the discharge pipe.

The seal arrangement shall consist of mechanical oil seal, single cofferdam lip and a seal set. The seal set is only to be exposed to static head from the pumped fluid externally and cofferdam barrier pressure inside.

The space between the seals shall be filled with a leak control fluid under static pressure.

The header tank on the pump top plate shall be provided with a level indication.

Wear rings shall be fitted between the impeller and the volute casing.

The pump shall be equipped with a backstop unit on the shaft.

A remote operated speed torque control valve shall be mounted on the top of the pump to enable regulation of the speed / capacity of the pump step-less within the capacity operating range.

It shall also be possible to control speed/ capacity locally at pump side.

Pump length, number of pipestacks and associated lengths shall be clearly indicated in the data sheet as per paragraph 5.1.

Six (6) meters length individual pipestack shall be provided as a minimum.

The following accessories shall be provided for each pump by Vendor:

- Deck trunk in mild steel, coated by Contractor to be welded to deck
- Bolts in AISI 316L stainless steel for connecting pump's top-plate to deck trunk
- Gasket between pump top-plate and deck trunk
- Intermediate support rings in AISI 316L stainless steel
- Bottom support in AISI 316L stainless steel
- Service ball valve for hydraulic high pressure branch line in AISI 316L stainless steel