

GENERAL SPECIFICATION

ROTATING MACHINERY

GS EP MEC 026

Rotating Machine Package Specification Motopump without separate lube oil system

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1. Scope

1.1 Purpose

This specification defines the minimum design, fabrication, inspection and testing requirements for the supply of the motopump (centrifugal type with rolling element bearings or self-lubricated hydrodynamic bearings (non-pressure-fed), without separate lube oil system) packages. It is an exhaustive document detailing the scope of supply and the associated design rules requested by TOTAL E&P for the procurement of these motopump packages.

1.2 Application

This document applies to the design of pump packages directly driven by an electrical motor, supported by rolling element bearings or self-lubricated hydrodynamic bearings (non-pressure-fed), without separate lube oil system. This specification applies to offshore and onshore applications.

1.3 General Rules

All deviations from this specification or the documents referred to herein shall be stated in writing in the Appendix 5 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.

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 5 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
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

Reference	Title
IEC 60034-6	Rotating electrical machines - Part 6 Methods of cooling (IC code)
IEC 60079-10-1	Explosive atmospheres - Part 10-1 Classification of areas - Explosive gas atmospheres
ISO 780	Packaging - Distribution packaging - Graphical symbols for handling and storage of packages

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 5. 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 COR 354	External protection of onshore structures and equipment by painting
GS EP DEV 001	Asset Objects Tagging
GS EP ELE 011	Electrical requirements for packaged units
GS EP ELE 031	Design of earthing and bonding systems for Offshore Installations
GS EP ELE 032	Design of earthing and bonding systems and lightning protection for Onshore Installations
GS EP ELE 061	Minimum requirements for HV & LV cable sizing

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Reference	Title
GS EP ELE 079	Electrical apparatus for potentially explosive gas atmospheres
GS EP ELE 111	HV Induction motors
GS EP ELE 116	LV Induction Motor
GS EP ELE 161	Electrical cables
GS EP EXP 217	Spare Parts requirements for EPCs, Supplier, Manufacturer and MIE Team
GS EP INS 101	Instrumentation Design
GS EP INS 110	Instrumentation for package units
GS EP INS 115	Instrument Earthing
GS EP INS 116	Instrument Cables
GS EP MEC 270	Pumps - Shaft Sealing Systems for Centrifugal and Rotary Pumps according to API Standard 682
GS EP MEC 271	Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries according to API Standard 610
GS EP MEC 541	Form-wound Squirrel-Cage Induction Motors - 500 Horsepower and Larger according to API Standard 541
GS EP PVV 112	Piping material classes
GS EP PVV 211	Design and fabrication of pressure vessels according to ASME VIII

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.

No amendment shall be made to the GS EP MEC specifications since these documents are already amended in the paragraph 4.1.

Project Documents (to be completed by Company or Contractor)

	Designation	Rev	Reference
1	Pump system PFD (*)		
2	Pumping area 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.

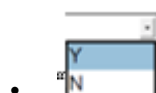
3. Scope of supply and exclusion

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
1	ON SKID EQUIPMENT				
1.1	Pump including but not limited to:				
1.1.1	Pump	As per GS EP MEC 271 and as per data sheet referenced paragraph 5 of this specification. Bearings selection as per GS EP MEC 271 , paragraph 6.10.1.	X		
1.1.2	Mechanical seals and seal system	As per GS EP MEC 270 and as per data sheet referenced paragraph 5 of this specification.	X		
1.1.3	Counter flanges for main process connections	As per API STD 610 and GS EP MEC 271 . Counter flanges as per GS EP PVV 112 or Project piping classes -if any-.	X		
1.2	Main electric motor including but not limited to:				
1.2.1	Main electric motor	As per GS EP ELE 111 or GS EP ELE 116 (below 375 kW) or GS EP MEC 541 and as per data sheet referenced in paragraph 5.2 of this specification.	X		
1.2.2	Terminal boxes	Terminal boxes mounted on the electric motor. The supply of the associated cable glands is defined in the data sheet referenced in paragraph 5 of this specification.	X		
1.2.3	All associated instrumentation and auxiliary junction boxes		X		
1.3	Power transmission equipment including but not limited to:				
1.3.1	Flexible spacer type coupling	As per API STD 610 .	X		
1.3.2	Coupling guard	As per API STD 610 .	X		
1.4	Base plate including but not limited to:				
1.4.1	Fabricated steel common base plate	As per paragraph 4.2.2.	X		

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#	Item	Description	Required	Tag	Quantity
1.5	Controls & Instrumentation , including but not limited to:				
1.5.1	Terminal junction boxes	All terminal junction boxes, made of stainless steel AISI 316, located at skid edge as per GS EP INS 101 .	X		1
1.5.2	Cable glands	As per GS EP INS 101 . Junction boxes to be provided with cable gland plates and associated cable glands.	X		1
1.5.3	Instrumentation cables	All instrument cables between instruments and skid mounted junction boxes / local gauge board indicator as per GS EP ELE 161 and GS EP INS 116 .	X		1
1.5.4	Shut down push buttons		X		1
1.6	Electrical including but not limited to				
1.6.1	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		
1.6.2	Emergency stop push buttons	Local emergency stop push buttons for each electric motor, as per GS EP ELE 011	X		
2	OFF SKID EQUIPMENT (shipped loose)				
2.1	Variable Speed Drive system including but not limited to:				
2.1.1	Variable Speed Drive	As per data sheet referenced in paragraph 5 and as per paragraph 4.2.5 of this specification. []	N/A (in case of fixed speed pump) []	X	1
2.1.2	Power transformer	As per data sheet referenced in paragraph 5.4 and as per paragraph 4.2.5 of this specification. Note: Power transformer, when required, to be supplied by pump package Vendor.	1	1	1
2.2	Valves, instruments and piping including but not limited to:				
2.2.1	Minimum flow protection	By Automatic Minimum Flow Valve.	X	1	1
2.3	Spare parts and special tools including but not limited to:				
2.3.1	Special tools	Detailed scope is given in the paragraph 8.2.	X		1 set
2.3.2	Spare parts for, commissioning and start up	Detailed scope is given in paragraph 8.1.1.	X		1 set
2.3.3	Capital spare parts	Detailed scope is given in the paragraph 8.1.2.	X		1 set
3	MISCELLANEOUS				
3.1	Baseplate anchors and shims	As per paragraph 4.2.2 and Appendix 2.	X		1
3.2	Piping	All necessary on-skid tubing / piping.	X		1
3.3	Documentation	Set of documents as per Appendix 3.	X		1 set
3.4	Maintenance and Access Review	Review of the motopump package maintenance capabilities.	X		1
3.5	Personal protection	As per paragraph 4.2.8.1.	X		1

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#	Item	Description	Required	Tag	Quantity
3.6	Painting and coating	As per paragraph 4.2.7.	X		1
3.7	Limit flanges	All limit flanges as per API STD 610 , GS EP PVV 112 or project piping classes -if available- equipped with blind flanges for transportation.	X		1
3.8	Package packing and preservation	As per paragraph 9.	X		1
3.9	Earthing network	Earthing design and implementation as per GS EP ELE 031 or GS EP ELE 032 and GS EP INS 115 .	X		1
3.10	Lifting tools for the complete package	Consists of slings, shackles, and spreader bar. Lifting tools to be designed to lift the package both boxed and unboxed.	X		1 set(s)
3.11	Specific climate considerations	☐ Tropicalization ☐ Winterization ☐ None	X		1
3.12	Tagging	Tagging as per GS EP DEV 001 .	X		
4	TESTS				
4.1	Pump	As per GS EP MEC 271 paragraph 7.3.			
4.1.2	Electric motor	As per GS EP ELE 111 or GS EP ELE 116 or GS EP MEC 541 and data sheet referenced in the paragraph 5.2 of this specification.	X		1
4.1.3	Complete unit tests	As per paragraph 7.	X		1
4.1.4	Noise and vibration tests	As per paragraphs 4.2.8.2 and 7.	X		1
4.2	Site Acceptance Tests				
4.2.1	Complete unit tests	As per paragraph 7.6 of this specification.	X		1

3.2 Exclusions

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

- Counter flanges, gasket and bolting for connecting flanges at battery limits of Vendor's supply (except pump companion flanges in Vendor's scope)
- All piping outside the package
- Electric and instrument cables outside the package
- All earthing cables outside the package.

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

This paragraph addresses the open technical points that are Project specific within the Company General Specifications. The paragraphs mentioned in the following charts refer to TOTAL E&P General Specifications.

GS EP MEC 270		
Paragraph	Data Sheets	Project
7.1.2.5	X	
9.1.1		Refer to paragraph 4.2.4 of this specification.
11.1.2		Refer to Appendix 3 of this specification.

GS EP MEC 271		
Paragraph	Data Sheets	Project
6.1.2	X	For site and utility conditions, refer to paragraph 6 of this specification.
6.1.14	X	Refer to paragraph 4.2.8.2 of this specification for acceptance criteria and paragraph 7 of this specification for testing.
6.1.22	X	
6.11.3		☐ Pure oil-mist ☐ Purge oil-mist
6.12.1.1	X	
6.12.1.5	X	
6.12.1.9	X	
6.12.1.12	X	
7.2.10	X	Refer to paragraph 4.2.3 of this specification.
7.2.15		Ignition hazard assessment: ☐ Required ☐ Not required
7.3.1		Refer to paragraph 4.2.2 of this specification.
7.3.6		Stainless steel spacer plate: ☐ Required ☐ Not required
7.3.14		Refer to paragraph 4.2.2 of this specification.
7.5.2.4	X	
8.2.2.6	X	
8.2.2.7	X	
8.2.2.8	X	
8.3.4.1	X	Refer to paragraph 7 of this specification.
8.3.4.4.1	X	Refer to paragraph 7 of this specification.

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GS EP MEC 271

Paragraph	Data Sheets	Project
8.3.4.6		Refer to paragraph 7 of this specification.
8.4.1		Refer to paragraph 9 of this specification.
9.2.6.1	X	
9.2.6.4	X	
9.2.8.3		Shipping and storage container to store the rotor or cartridge vertically: ☐ Required ☐ Not required
9.2.8.4		Shipping and storage container designed to allow inert-gas inhibition: ☐ Required ☐ Not required
10.3.5.1		Refer to paragraph 4.2.13 of this specification.

GS EP MEC 541

Paragraph	Data Sheets	Project															
4.1.2		Refer to paragraph 6 of this specification.															
4.1.3		Refer to paragraph 5.6 of this specification.															
4.4.1.2.2	X	Motor cooling selection: <table border="1"> <thead> <tr> <th>Common Enclosure Type</th><th>Method of cooling (IEC 60034-6)</th><th>Selection</th></tr> </thead> <tbody> <tr> <td>Totally enclosed</td><td></td><td></td></tr> <tr> <td>Fan cooled</td><td>IC411</td><td>☐</td></tr> <tr> <td>Water to air cooled</td><td>IC81W^a IC86W^b</td><td>☐ ☐</td></tr> <tr> <td>Air to air cooled</td><td>IC511^a IC516^b IC611^a IC616^a IC666^b</td><td>☐ ☐ ☐ ☐ ☐</td></tr> </tbody> </table> ^{a)} Shaft driven secondary fan ^{b)} Auxiliary secondary fan	Common Enclosure Type	Method of cooling (IEC 60034-6)	Selection	Totally enclosed			Fan cooled	IC411	☐	Water to air cooled	IC81W ^a IC86W ^b	☐ ☐	Air to air cooled	IC511 ^a IC516 ^b IC611 ^a IC616 ^a IC666 ^b	☐ ☐ ☐ ☐ ☐
Common Enclosure Type	Method of cooling (IEC 60034-6)	Selection															
Totally enclosed																	
Fan cooled	IC411	☐															
Water to air cooled	IC81W ^a IC86W ^b	☐ ☐															
Air to air cooled	IC511 ^a IC516 ^b IC611 ^a IC616 ^a IC666 ^b	☐ ☐ ☐ ☐ ☐															
4.4.1.2.4		b) Cooler sparing philosophy 1x100%: 2x100%:															
4.4.8.3	X	Supply of thermostatically controlled heating devices in the bearing housings is not requested.															
4.4.10.1.2		Refer to paragraph 6 of this specification.															
4.4.10.6.3	X	Redundant motor driven auxiliary fan is required.															

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GS EP MEC 541

Paragraph	Data Sheets	Project
5.1.6	X	Requirements for the main terminal box: a) thermal insulation on the interior top side is not requested b) space heaters in accordance with 5.4.2 are requested. c) provisions for purging; Requested: ☐ Not Requested: ☐ d) removable links; Requested: ☐ Not Requested: ☐ e) adequate space for termination of shielded cables; Requested: ☐ Not Requested: ☐ f) quick disconnect type bushings or receptacles; Requested: ☐ Not Requested: ☐ g) arresters and surge capacitors (not applicable with ASDs); Requested: ☐ Not Requested: ☐ h) differential and phase current transformers are requested for motors rated above 5 MW only. i) As per Manufacturer standard. j) voltage transformers are not requested. k) copper ground bus is requested. l) partial discharge sensors are: a. not requested for LV motors b. for HV motors: Requested: ☐ Not Requested: ☐ m) insulated terminations and interior jumpers. Requested: ☐ Not Requested: ☐
5.5.4	X	Requirements for air filters: Requested: ☐ Not Requested: ☐
5.5.5		Specified instrument to measure the pressure drop across the filter is not requested.
5.6.2.1		Supply of Surge Capacitors. Requested: ☐ Not Requested: ☐
5.6.2.2		Supply of Metal Oxide Surge Arresters. Requested: ☐ Not Requested: ☐
8.5.1 8.7.1 8.7.4		Refer to Appendix 3 of this specification.

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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[1]	Zone 2[1]	Zone 1[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.
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.