

GENERAL SPECIFICATION

ROTATING MACHINERY

GS EP MEC 021

Rotating Machine Package Specification Motopump
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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) 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 motopump packages.

1.2 Application

This document applies to the design of all pumps packages driven by electrical motors with a rated power greater or equal to 500 kW.

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 Supplier's cost. Exceptions and deviations to the specifications shall be part of Supplier's proposal and will be subject to Company approval.

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

In cases the Supplier provides outsourced equipment, he shall be responsible for the coordination of the Sub-Suppliers, and ensure the full compatibility of all the equipment. In particular, they 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 Supplier standard components.

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 and shall therefore not be considered as a General Specification any more. Then, the General Specification shall be attributed a Project reference number with the associated Project front page.

Preamble shall be completed with the Project description (location, number of machines, etc.).

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".

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The applicable documents shall be considered in the following order:

- Local regulations
- Classification Society Rules (If applicable)
- Frame agreement if available - Frame agreement: Applicable ☐ - Not 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
1999/92/EEC (ATEX 118 ¹ /ATEX 137 ²)	European Directive 1999/92/EEC (16/12/99) on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres
94/9/EC (ATEX 100a ¹ /ATEX 95 ²)	European Directive 94/9/EC (23/03/94) on the approximation of the laws of the Member State concerning equipment and protective systems intended for use in potentially explosive atmosphere
API Std 610	Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries
API Std 614	Lubrication, Shaft-sealing and Oil-control Systems and Auxiliaries
ASME VIII Division 1	Boiler and Pressure Vessel Code
DIN 55473	Auxiliary means of packaging - Desiccant in bag - Technical delivery conditions.
IP 15	Area Classification Code for Petroleum Installation handling flammable fluids - July 2005 (3 rd edition)
ISO 780	Packaging. Pictorial marking for handling of goods

¹ Reference to Articles 100/118 of the Treaty of Rome

² Reference to Articles 95/137 of the Treaty of Amsterdam

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Reference	Title
NF H00-310	Industrial packagings. Flexible and heat sealing protection materials of low coefficient of water vapour transmission ($P < 0.3 \text{ g/m}^2 \text{ 24 h}$)
NF H00-320	Packaging. Desiccant. Specifications and tests
US MIL STD-2073-1 E	Standard Practice for Military Packaging
US MIL D 3464E	Desiccants, activated, bagged, packaging use and static dehumidification.
US MIL PRF 131K	Performance Specification: Barrier Materials, Watervaporproof, Greaseproof, Flexible, Heat-Sealable

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.

TOTAL EP General Specification Referential is applicable for the following Project:

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 COR 356	Corrosion Protection of Fasteners for Subsea and Topsides Applications
GS EP ELE 011	Electrical requirements for packaged units
GS EP ELE 031	Design of earthing and bonding systems
GS EP ELE 079	Electrical apparatus for potentially explosive gas atmospheres
GS EP ELE 111	Induction motors
GS EP ELE 121	HV Variable Speed Drive Systems

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Reference	Title
GS EP ELE 141	Power transformers
GS EP ELE 161	Electrical cables
GS EP EXP 217	Requirements to Vendors, Suppliers and EPC'S for spare parts
GS EP INS 101	Instrumentation engineering, supply and construction general requirements
GS EP INS 102	Instrumentation identification
GS EP INS 107	Design and installation of instrumentation links
GS EP INS 110	Instrumentation for package units
GS EP INS 120	Control and Choke Valves
GS EP INS 135	Cyber Security requirements for design and supply of ICSS and Package Systems
GS EP INS 137	On/off valve control panels and actuators functional and construction requirements
GS EP INS 900	Instrument hook-up diagrams
GS EP MEC 101	Driver Power Sizing
GS EP MEC 240	Special Purpose Couplings for Petroleum, Chemical, and Gas Industry Services according to API Standard 671
GS EP MEC 242	Special Purpose Gear Units for Petroleum, Chemical and Gas Service Industries According to API Standard 613
GS EP MEC 270	Supply of Mechanical Seal according to API Standard 682
GS EP MEC 271	Centrifugal Pumps for the Petroleum, Chemical and Gas Industry Services according to API Standard 610
GS EP MEC 281	Lubrication, Shaft Sealing and Oil Control Systems and Auxiliaries according to ISO 10438 / API Standard 614
GS EP MEC 292	Rotating Machines Packages Installation Requirements
GS EP MEC 300	Noise and Vibration of Rotating Machine Packages
GS EP PVV 102	Piping Hook-up Standards
GS EP PVV 112	Piping material classes
GS EP PVV 142	Valves
GS EP PVV 143	Metallic pipes
GS EP PVV 144	Fittings
GS EP PVV 145	Flanges
GS EP PVV 146	Bolting for piping
GS EP PVV 147	Gaskets for piping and vessels

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Reference	Title
GS EP PVV 175	Cleaning of piping and vessels
GS EP PVV 211	Design and fabrication of pressure vessels according to ASME VIII
GS EP PVV 412	Plate and frame heat exchanger
GS EP PVV 415	Design and fabrication of air cooler
GS EP STR 001	Weight monitoring and weighing offshore units
GS EP STR 103	Design and fabrication of skids and equipment supporting structures

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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.



- "Y" means that the item is an optional requirement specific to the project. "Y" for YES if the option is selected or "N" for 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.	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	Counter flanges as per GS EP PVV 112 or Project piping classes -if any-.	X		
1.2	Electric motor including but not limited to:				
1.2.1	Main electric motor	As per GS EP ELE 111 and GS EP MEC 101 and as per data sheet referenced in paragraph 5.2 of this specification.	X		
1.2.2	Electric terminal box	HV electric terminal box 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	Electric motor cooler	As per data sheet referenced in paragraph 5 of this specification.	X		
1.2.4	All associated instrumentation and auxiliary junction boxes		X		
1.3	Power transmission equipment including but not limited to:				
1.3.1	Gearbox	As per GS EP MEC 242 and as per data sheet referenced paragraph 5 of this specification. ☐	N/A if pump direct driven. ☐	X	
1.3.2	Temperature and vibration probes	As per GS EP MEC 242 paragraph 6.4.2. ☐	N/A if pump direct driven. ☐	X	

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#	Item	Description		Required	Tag	Quantity
1.3.3	LS flexible spacer type coupling	As per paragraph 4.2.3 of this specification. 	N/A if pump direct driven. 	X		
1.3.4	LS coupling guard	As per paragraph 4.2.3 of this specification. 	N/A if pump direct driven. 	X		
1.3.5	HS flexible spacer type coupling	As per paragraph 4.2.3 of this specification.		X		
1.3.6	HS coupling guard	As per paragraph 4.2.3 of this specification.		X		
1.4	Mineral lube oil system (As per GS EP MEC 281 and as per data sheet referenced paragraph 5.6 of this specification) including but not limited to: Note: only in case hydrodynamic bearings are provided.					
1.4.1	Lube oil tank	As per GS EP MEC 281 part 2 paragraph 4.3.13.		X		
1.4.2	Oil mist separator	As per GS EP MEC 281 part 2 paragraph 4.3.5.1.		X		
1.4.3	Main oil pump	Shaft driven, if there is a gearbox or if the main pump runs at constant speed, below 3000 rpm.		X		
1.4.4	Standby oil pump	Driven by AC motor following GS EP ELE 111 .		X		
1.4.5	Lube oil cooler	Lube oil air cooler made of AISI 316 stainless steel as per GS EP PVV 415 and as per GS EP MEC 281 part 2 paragraph 4.5. If any, this cooler shall also be used for synthetic lube oil cooling. 	Lube oil water cooler as per GS EP PVV 412 (oil pressure above water pressure) as per GS EP MEC 281 part 2 paragraph 4.5. If any, this cooler shall also be used for synthetic lube oil cooling. 	X		
		 N/A Off skid				
1.4.6	Oil filters for lube oil	Twin AISI 316 stainless steel oil filters with continuous flow transfer valve for lube oil.		X		
1.4.7	All associated piping, piping accessories and valves	All associated interconnecting piping, piping accessories and valves made in AISI 316/316L stainless steel on the whole system as per paragraph 4.2.7 of this specification. Tubing is not allowed, except for the instruments impulse lines as per GS EP PVV 102 , GS EP INS 107 and GS EP INS 900 .		X		
1.4.8	All associated instrumentation	As per data sheet referenced paragraph 5 of this specification, as per paragraph 4.2.5 of this specification and mounted as per GS EP PVV 102 , GS EP INS 900 .		X		
1.4.9	One local gauge panel	Made of AISI 316/316L stainless steel with instruments as per as per data sheet referenced paragraph 5.6 of this specification.		X		
1.5	Base plate including but not limited to:					
1.5.1	Fabricated steel common base plate	As per paragraph 4.2.2 of this specification.		X		
1.5.2	Baseplate supports	 3 point support	N/A if concrete foundations or multipoint rigid support. 	X		
		4 temporary supports and jacking points as per paragraph 4.2.2.1 of this specification.		X		

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#	Item	Description	Required	Tag	Quantity
1.6	Controls & Instrumentation , including but not limited to:				
1.6.1	Terminal junction boxes	All terminal junction boxes located at skid edge as per GS EP INS 101 and GS EP INS 107 .	X		
1.6.2	Cable glands	Cable glands for departing multi-core cables, defined by Project and blinded off suitably for transport and storage. In case the option is not selected, the gland plates shall be pre-drilled and blinded off.	Option		
		For all other cables, junction boxes shall be provided with cable gland plates and associated cable glands.	X		
1.6.3	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 107 .	X		
1.6.4	Instrumentation Cable trays	All necessary cables trays with covers made of AISI 316 between instruments and skid mounted junction boxes as per GS EP INS 107 . Empty cable trays shall be installed for the departing multi-core cables –supplied and installed by others– between the terminal junction boxes and the skid edge.	X		
1.6.5	Shut down push buttons		X		
1.7	Electrical including but not limited to				
1.7.1	Electrical cables trays	All necessary cables trays with covers made of AISI 316 between all electrical consumers mounted on skid and the skid edge.	X		
2	OFF SKID EQUIPMENT (shipped loose)				
2.1	Variable Speed Drive system including but not limited to:				
2.1.1	HV Variable Speed Drive	As per data sheet referenced in paragraph 5 of this specification and as per GS EP ELE 121 .	X		
2.1.2	Power transformer	As per data sheet referenced in paragraph 5.4 of this specification and as per paragraph 4.17 of GS EP ELE 121 and GS EP ELE 141 .	X		
2.1.3	Harmonic Filter	As per GS EP ELE 121 .	X		
2.2	Mineral lube oil system including but not limited to:				
2.2.1	Lube oil cooler	Lube oil air cooler made of AISI 316 stainless steel as per GS EP PVV 415 and as per GS EP MEC 281 part 2 paragraph 4.5. 	N/A, located on skid. 	X	
2.3	Valves, instruments and piping including but not limited to:				
2.3.1	Minimum flow protection valve	Flow control valve as per GS EP PVV 112 or Project piping classes (if any), GS EP PVV 142 and GS EP INS 120 .	X		
2.3.2	Flame arrestors	As per paragraph 4.2.7.2 of this specification.	X		

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#	Item	Description	Required	Tag	Quantity
2.4	Controls & Instrumentation –only for packages categorized P3 as per paragraph 4.2.5.1 of this specification- including but not limited to:				
2.4.1	UCP	As per GS EP INS 110 , including PLC for control/safety, panel mounted HMI. Full licenses for all software.	X		
2.4.2	ICSS interface	Communication cards, relays, signal convertors, etc. to interface with ICSS and support systems (if any).	X		
2.4.3	Shut down push button	Mounted on the UCP.	X		
2.4.4	VTMS	Vibration and Temperature Monitoring System to control the complete shaft line vibration and temperature sensors integrated inside UCP.	X		
2.4.5	Load sharing control	Software and panel-mounted hardware to control the pumps load sharing, integrated inside the UCP.	Option		
2.5	Spare parts and special tools including but not limited to:				
2.5.1	Special tools	Detailed scope is given in the paragraph 8.2 of this specification.	X		1 set
2.5.2	Spare parts for, commissioning and start up	Detailed scope is given in paragraph 8.1.1 of this specification.	X		1 set
2.5.3	Capital spare parts	Detailed scope is given in the paragraph 8.1.2 of this specification.	X		1 set
2.5.4	Tools trolley	Lockable trolley to carry the motopump package tools and special tools.	X		1
3	MISCELLANEOUS				
3.1	Baseplate anchors and shims	As per paragraph 4.2.2 and Appendix 2 of this specification.	X		
3.2	Off skid equipment anchors and shims	All anchors and shims for all off skid equipment supplied by SUPPLIER.	X		
3.3	Piping	All necessary on-skid tubing / piping.	X		
3.4	Documentation	Set of documents as per Appendix 3 of this specification.	X		1 set
3.5	Package 3D model review	Review of the motopump package 3D models for maintenance areas review as per paragraph 4.2.11 of this specification.	X		1
3.6	Maintenance laptop	Including software for UCP configuration (only for P3 packages).	X		
3.7	Personal protection	As per paragraph 4.2.9.1 of this specification.	X		
3.8	Painting and coating	As per paragraph 4.2.8 of this specification.	X		
3.9	Limit flanges	All limit flanges as per GS EP PVV 112 or project piping classes-if available- equipped with blind flanges for transportation.	X		
3.10	Package packing and preservation	As per paragraph 9 of this specification.	X		
3.11	Earthing network	Earthing design and implementation as per GS EP ELE 031 and GS EP INS 107 .	X		
3.12	Oil conditioner		X		

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#	Item	Description	Required	Tag	Quantity
3.13	Lube oil system flushing kit	Kit made of all necessary flexible hoses for machinery bearings bypass.	X		1 set
3.14	Walkways and ladders	Walkways and ladders to make access to any equipment mounted on the package.	Option		
3.15	Lifting tools for the complete package	Consists of slings, shackles, and spreader bar as per paragraph 4.2.2.4 of this specification and as per GS EP STR 103 .	X		1 set
3.16	Backup	Complete backup hard disk with application software, PLC program, HMI and any firmware prior to shipment (only for P3 packages).	X		
3.17	Software	OEM CD/DVD for any software used with full licenses (only for P3 packages).	X		
3.18	Specific climate considerations	☐ Tropicalization ☐ Winterization ☐ None	X		
4	TESTS				
4.1	Factory tests				
4.1.1	Pump	As per paragraph 7.3 of GS EP MEC 271 .	X		
4.1.2	Electric motor	As per paragraph 7 of GS EP ELE 111 and data sheet referenced in the paragraph 5.2 of this specification.	X		
4.1.3	Gearbox (if any)	As per paragraph 4.3 of GS EP MEC 242 .	X		
4.1.4	Lube oil unit(s) and lube oil cooler(s)	As per part 1 paragraph 7.3 and part 2 paragraph 7.3 of GS EP MEC 281 .	X		
4.1.5	Mechanical seals	As per paragraph 10 of GS EP MEC 270 .	X		
4.1.6	UCP	As per paragraph 7.4 and Appendix 5 of GS EP INS 110 , including communication test with the ICSS (only for P3 packages).	X		
4.1.7	Complete unit tests	As per paragraph 7 of this specification.	X		
4.1.8	Noise and vibration tests	As per paragraphs 4.2.9.2 and 7 of this specification.	X		
4.2	Site Acceptance Tests				
4.2.1	Complete unit tests	As per paragraph 7.6 of this specification.	X		

Vendor shall be responsible for the physical and technical compatibility of the entire package and shall ensure that all equipment and components provided are suitable for the operations intended.

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3.2 Exclusions

The following equipment are not included in the scope of supply:

- 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.

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4. Basis of design

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

4.1 Particular specification for rotating equipment

This paragraph indicates where the Company General Specifications Project specificities are covered. The paragraphs mentioned in the following charts refer to TOTAL EP General Specifications Referential **2013**.

GS EP MEC 240		
Paragraph	Data Sheets	Project
5.3	X	
10.3	X	Site conditions as per paragraph 6.1 of this specification.
12.5.2	X	
12.5.3	X	
13.2.2.1		Drawings as per Appendix 3 of this specification.
A.2.5	X	Site conditions as per paragraph 6.1 of this specification.
A.4.1	X	Site conditions as per paragraph 6.1 of this specification.

GS EP MEC 242		
Paragraph	Data Sheets	Project
2.1.4	X	
2.1.6		Control of sound pressure level method: Refer to paragraph 4.2.9.2 of this specification for the maximum allowable sound pressure level.
2.1.10		Refer to paragraph 6.1 of this specification.
2.1.14	X	Refer to paragraph 6 of this specification.
2.1.16	X	
3.1	X	List of accessories to be supplied:
3.3.1.1	X	Gearbox mounted on:
4.1.1	X	

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Paragraph	Data Sheets	Project
4.3.2.2.12	X	
4.3.2.2.16		Additional speeds to be tested: Duration and data to be recorded:

GS EP MEC 270

Paragraph	Data Sheets	Project
7.2.1.4	X	
7.3.1.1	X	
8.5.5.2	X	
9.1.4		Refer to paragraph 4.2.5 of this specification.
9.6.2		Refer to paragraph 4.2.5 of this specification.
9.7.2		Refer to paragraph 4.2.5 of this specification.
9.8.3		Refer to paragraph 4.2.5 of this specification.
10.3.1.1.2	X	
J.7.2.c		Refer to Appendix 4 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.
		HPRT (Annex C) applicable ☐ Yes ☐ No
6.1.8	X	
6.1.14	X	
6.1.22	X	
6.1.29.1	X	

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Paragraph	Data Sheets	Project
6.2	X	
6.4.1.2	X	
6.4.3.1	X	
6.8.9		Additional flush port: ☐ Required ☐ Not required
6.8.13	X	
6.8.14	X	This barrier fluid refilling unit installed: ☐ On skid ☐ Transportable trolley
6.10.1.6		Bearing system life calculation: ☐ Required ☐ Not required
6.11.13	X	
6.12.1.1	X	
6.12.1.5	X	
6.12.1.9	X	
6.12.1.12	X	
6.12.4.1	X	
6.12.4.3	X	
7.2.10	X	Refer to paragraph 4.2.3 of this specification.
7.2.15		Ignition hazard assessment: ☐ Required ☐ Not required
7.3.6		Stainless steel spacer plate: ☐ Required ☐ Not required
7.3.14		Refer to paragraph 4.2.2.3
7.4.1	X	
7.4.2.1	X	Refer to paragraph 4.2.6 of this specification.
7.4.2.4	X	
7.5.2.4	X	
8.2.1.1	X	
8.2.1.3	X	
8.2.2.6	X	
8.2.2.7	X	