

GENERAL SPECIFICATION

ROTATING MACHINERY

GS EP MEC 030

Rotating Machine Package Specification Turbocompressor

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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 turbocompressor (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 turbocompressor packages.

1.2 Application

This document applies to the design of all centrifugal compressors packages driven by gas turbines. It excludes any other type of gas compressor. 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 6. 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.

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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 6.

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 613	Special Purpose Gear Units for Petroleum, Chemical and Gas Industry Services
API STD 614	Petroleum, petrochemical and natural gas industries - Lubrication, Shaft-sealing and Oil-control Systems and Auxiliaries
API STD 616	Gas Turbines for Petroleum, Chemical, and Gas Industry Services
API STD 617	Axial and Centrifugal Compressors and Expander-compressors
API STD 670	Machinery Protection Systems

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Reference	Title
ASME BPVC Section VIII Div 1	ASME Boiler and Pressure Vessel Code (BPVC), Section VIII- Rules for Construction of Pressure Vessels - Division 1
ASME PTC 10	Performance test code on compressors and exhausters
ASME PTC 22	Gas Turbines - Performance Test Code
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
IEC 60079-10-1	Explosive atmospheres - Part 10-1 Classification of areas - Explosive gas atmospheres
ISO 21789	Gas Turbine applications - Safety
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 6. 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.

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Reference	Title
GS EP COR 170	Materials for upstream sour service application - Specification for selection and design
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 001	Electrical design criteria - Application restricted to Appendix 3
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
GS EP ELE 079	Electrical Apparatus for Potentially Explosive Gas Atmospheres
GS EP ELE 116	LV Induction Motor
GS EP ELE 137	Distribution boards
GS EP ELE 151	DC Uninterruptible Power Systems (UPS)
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 103	Instrument Database Management
GS EP INS 106	Instrument Installation
GS EP INS 109	Instrument cabinets

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Reference	Title
GS EP INS 110	Instrumentation for package units
GS EP INS 114	Instrument Tubing and Fittings
GS EP INS 115	Instrument Earthing
GS EP INS 116	Instrument Cables
GS EP INS 120	Control Valves
GS EP INS 125	Safety Relief Valves and Rupture Discs
GS EP INS 135	Cybersecurity Requirements for Industrial Information Systems (SII)
GS EP INS 137	On/Off Valve Control Panels and Actuators
GS EP INS 158	I/O Assignment Principles
GS EP INS 900	Instrument Hook-up diagrams
GS EP MEC 212	Gas Turbines for the Petroleum, Chemical and Gas Industry Services according to API Standard 616
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 Industry Services According to API Standard 613
GS EP MEC 251	Axial and Centrifugal Compressors and Expander-compressors according to API Standard 617
GS EP MEC 253	Anti Surge System for Centrifugal and Axial Compressors
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 Vibrations of Rotating Machine Packages
GS EP PVV 102	Piping Hook-up Standards

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Reference	Title
GS EP PVV 112	Piping material classes
GS EP PVV 211	Design and fabrication of pressure vessels according to ASME VIII
GS EP PVV 412	Plate heat exchangers
GS EP PVV 415	Design and fabrication of air cooler
GS EP PVV 511	Waste Heat Recovery Unit
GS EP PVV 610	Welding of piping and pressure containing equipment
GS EP PVV 821	Piping and Pressure vessel equipment specification for Rotating Machines Packages
GS EP SAF 050	Fire and Gas System and Fire Extinguishing System for Packaged Rotating Machinery Enclosures
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.

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

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Project Documents (to be completed by Company or Contractor)

	Designation	Rev	Reference
1	Compression PFD (*)		
2	Compression 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.

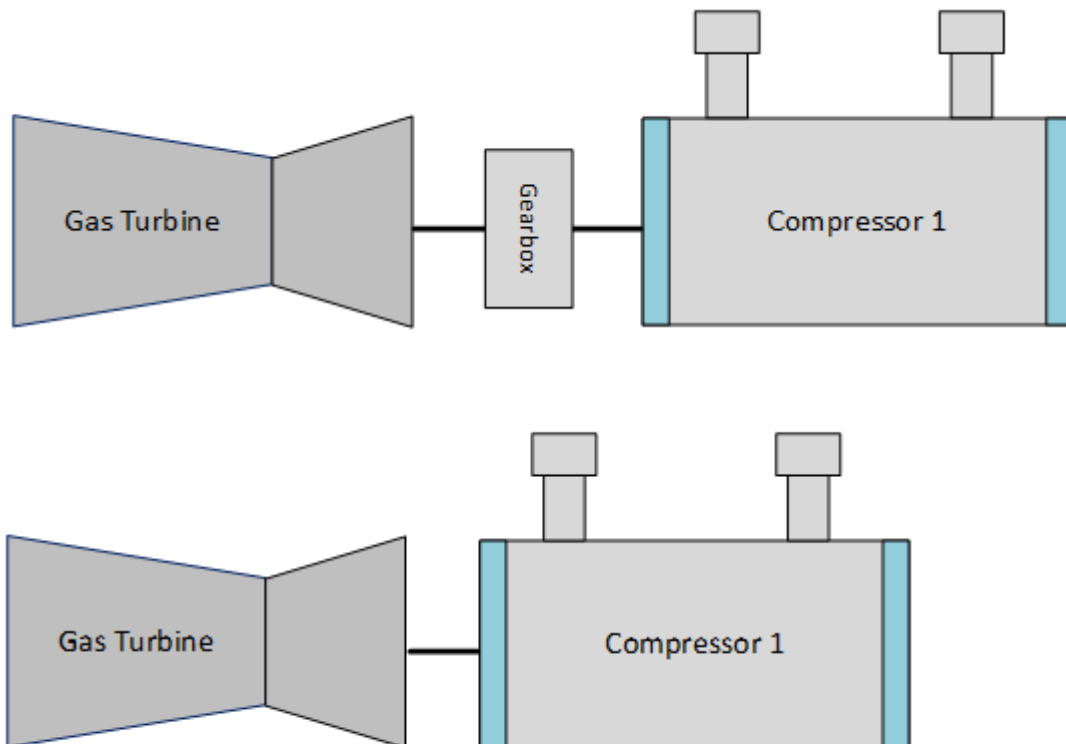
Mechanical data sheets are listed in paragraph 5.

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3. Scope of supply and exclusions

3.1 Scope of supply

The scope of supply consists in [] identical turbocompressor packages which overall layout is as per below scheme:



Note: Refrigeration compression trains may contain more than one compressor casing.

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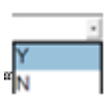
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The Vendor shall be responsible for the design, supply of materials, manufacture, assembly, supply of drawings and data, all Sub-Vendor co-ordination, testing, delivery and guarantees of the below components:

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	Compressor including but not limited to:				
1.1.1	Compressor	As per GS EP MEC 251 , GS EP COR 170 and as per data sheet referenced in paragraph 5.1 of this specification. The compressor will be equipped with dry gas seals as per GS EP MEC 251 and GS EP MEC 281 chapter 4 paragraphs 4.1 and 4.2.5.	X		
1.1.2	Counter flanges	Companion flanges for compressor main process connections, as per GS EP PVV 112 .	X		
1.1.3	Stage drains	As per GS EP MEC 251 .	X		
1.1.4	Temperature and vibration probes	As per GS EP MEC 251 .	X		
1.2	Gas turbine as per GS EP MEC 212 including but not limited to:				
1.2.1	Gas generator	As per GS EP MEC 212 and as per data sheet referenced in paragraph 5.2 of this specification.	X		
1.2.2	Gas generator bellmouth strainer and associated instrumentation	As per GS EP MEC 212 paragraph 5.6.2.9.	X		
1.2.3	Gas generator cover for long period of rest	As per GS EP MEC 212 paragraph 5.6.2.9.	X		
1.2.4	Power turbine (if any)	As per GS EP MEC 212 and as per data sheet referenced in paragraph 5.2 of this specification.	X		
1.2.5	Gas generator vibration and temperature monitoring	Shaft radial vibration and axial position sensors as per GS EP MEC 212 paragraph 5.4.7.8.2. Shaft bearings temperature sensors as per GS EP MEC 212 paragraph 5.4.7.5.	X		
1.2.6	Power turbine vibration and temperature monitoring	Shaft radial vibration & axial position sensors as per GS EP MEC 212 paragraph 5.4.7.8.2. Shaft bearings temperature sensors as per GS EP MEC 212 paragraph 5.4.7.5.	X		
1.2.7	Thrust load monitoring	For rotors suspended by roller and ball bearings, as per GS EP MEC 212 paragraph 4.8.4.1.2.	X		

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#	Item	Description	Required	Tag	Quantity
1.2.8	Compressor fouling monitoring	As per GS EP MEC 212 paragraph 5.4.2.7.	X		1
1.2.9	Blades and nozzle coating for marine environment	As per GS EP MEC 212 paragraph 4.10.1.1.	X		1
1.2.10	Gas turbine local gauge panel(s)		X		1
1.2.11	Equipment turning equipment	As per GS EP MEC 212 paragraph 5.1.3.1.	X	1	1
1.2.12	Leveling pads and screws	As per GS EP MEC 212 paragraph 5.3.2.3.	X		1
1.3	Gas fuel system including but not limited to:				
1.3.1	Shut off valves and associated vent valve	As per GS EP MEC 212 paragraph 5.8.1.2.1.	X		1
1.3.2	Fuel gas heat tracing and insulation	As per GS EP MEC 212 paragraph 5.8.1.2.1.3.	X		1
1.3.3	Emission suppression system	As per GS EP MEC 212 paragraph 5.8.7.1.	1		1
1.4	On skid gas generator compressor washing system including but not limited to:				
1.4.1	Off-line washing system	Washing system including piping, injection nozzles and associated instruments & control as per GS EP MEC 212 paragraph 5.6.1.16.	X		1
1.4.2	On-line washing system	Washing system including piping, injection nozzles and associated instruments & control as per GS EP MEC 212 paragraph 5.6.1.16.	1		1
1.5	Starting system including but not limited to:				
1.5.1	Starting driver	As per GS EP MEC 212 paragraph 5.1 and data sheet referenced in paragraph 5.2 of this specification.	X		1
1.5.2	Auxiliary gear(s)	As per GS EP MEC 212 paragraph 5.2.1.	X		1
1.6	Combustion air inlet system including but not limited to:				
1.6.1	Filter housing with all ancillaries	As per GS EP MEC 212 paragraph 5.6.	X		1
1.6.2	Gas detectors associated with required logic	As per GS EP SAF 050 and GS EP MEC 212 paragraph 5.6.2.1.7.	X		1
1.6.3	Set of instruments	Overall air inlet PDT, atmospheric absolute PT, atmospheric hygrometry transmitter as per GS EP MEC 212 paragraph 5.6.2.1.7.	X		1
1.6.4	Air filter	As per GS EP MEC 212 paragraph 5.6.2 & Appendix 1.	X		1
1.6.5	Anti-icing system	As per GS EP MEC 212 paragraphs 5.6.1.1 and 5.6.1.7.	1		1
1.6.6	Inlet air silencer	As per GS EP MEC 212 paragraph 5.6.2.5.	X		1
1.6.7	Inlet air ducting	As per GS EP MEC 212 paragraph 5.6.1.1.	X		1
1.6.8	Ladders, platforms and lifting devices	As per GS EP MEC 212 paragraph 5.6.2.1.7.	X		1
1.6.9	Inlet plenum	As per GS EP MEC 212 paragraph 5.6.2.9.	X		1

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#	Item	Description	Required	Tag	Quantity
1.6.10	Supporting steel structure	As per GS EP MEC 212 paragraph 5.6.2.1.9.	☐		☐
		On skid ☐			
1.7	Enclosure including but not limited to:				
1.7.1	Complete enclosure frame and general assembly	As per GS EP MEC 212 paragraph 5.7.5 and paragraph 4.2.3.1 of this specification.	X		☐
1.7.2	Enclosure AC air ventilation system	Enclosure air ventilation system with inlet and outlet, air dampers, ducts, silencers, 2x100% Eexd motofans, relevant instrumentation as per GS EP MEC 212 paragraphs 5.7.5.6, 5.7.5.6.1, 5.7.5.6.3, 4.1.14 and paragraph 4.2.3.1 of this specification.	X		☐
1.7.3	Enclosure FG detection facilities	As per GS EP SAF 050 .	X		☐
1.7.4	Enclosure lighting system	As per paragraph 4.2.3.1 and associated junction box paragraph 4.2.5.	X		☐
1.7.5	Enclosure instrumentation and monitoring system.		X		☐
1.7.6	Fire suppression system for turbine enclosure	As per data sheet referenced in paragraph 5.2 of this specification and GS EP SAF 050 .	X		☐
		☐ Water mist			
1.7.7	Lifting facilities	Lifting facilities for gas generator.	X		☐
1.8	Exhaust gas system including but not limited to:				
1.8.1	Exhaust stack		X		☐
1.8.2	Stack thermal insulation and cladding	As per paragraph 4.2.8.1.	X		☐
1.8.3	Exhaust diffuser		X		☐
1.8.4	Expansion joint	As per GS EP MEC 212 paragraph 5.6.3.3.	X		☐
1.8.5	Exhaust silencer	As per GS EP MEC 212 paragraph 5.6.3.1.	X		☐
1.8.6	Provisions for lightning system (supports for rod and cable)	To be provisioned on the exhaust ducting.	☐		☐
1.8.7	Exhaust duct thermal insulation and cladding for personnel protection	Personnel protection wherever personnel access is allowed.	X		☐
1.8.8	Two 3.5" sampling points	As per GS EP MEC 212 paragraph 5.6.3.2.3.	X		☐
1.8.9	Continuous emission level monitoring	As per GS EP MEC 212 paragraph 5.8.7.2.	☐		☐
1.8.10	Supporting steel	Supporting steel structure for all above equipment with all necessary fixation devices.	☐		☐
		☐ On skid			

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#	Item	Description	Required	Tag	Quantity
1.8.11	Ladders and platforms	Access ladder and platform to exhaust sampling connections as per GS EP MEC 212 paragraph 5.6.3.2.3.	☐		☐
		☐ On skid ☐ Off skid			
1.8.12	Waste heat recovery unit	As per GS EP PVV 511 and data sheet referenced in paragraph 5.7 of this specification.	☐		☐
1.9	Power transmission equipment including but not limited to:				
1.9.1	Gearbox	As per GS EP MEC 242 and data sheet referenced in paragraph 5.3 of this specification. ☐	N/A if compressor direct driven. ☐	X	☐
1.9.2	Temperature and vibration probes	As per GS EP MEC 242 . ☐	N/A if compressor direct driven. ☐	X	☐
1.9.3	LS flexible spacer type coupling	As per paragraph 4.2.3.2. ☐	N/A if compressor direct driven. ☐	X	☐
1.9.4	LS coupling guard	As per paragraph 4.2.3.2. ☐	N/A if compressor direct driven. ☐	X	☐
1.9.5	HS flexible spacer type coupling	As per paragraph 4.2.3.2.		X	☐
1.9.6	HS coupling guard	As per paragraph 4.2.3.2.		X	☐
1.10	Mineral lube oil system including but not limited to (as per GS EP MEC 281 part 2 and data sheet referenced in paragraph 5.2 of this specification):				
1.10.1	Lube oil tank	As per GS EP MEC 281 part 2 paragraph 4.3.13.		X	☐
1.10.2	Oil mist separator	As per GS EP MEC 281 part 2 paragraph 4.3.5.1.		X	☐
1.10.3	Main oil pump	Driven by AC motor following GS EP ELE 116 .		X	☐
1.10.4	Standby oil pump	Driven by AC motor following GS EP ELE 116 .		X	☐
1.10.5	Cool down lube oil	Oil pump driven by DC motor as per GS EP MEC 212 paragraph 5.4.6.1.		X	☐
1.10.6	Run down lube oil	Lube oil run down tank made of stainless steel AISI 316L as per GS EP MEC 281 part 2 paragraph 4.9.2.		X	☐
1.10.7	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 may 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 may also be used for synthetic lube oil cooling. ☐	X	☐
		☐ N/A Off skid			
1.10.8	Oil filters for lube oil	Twin AISI 316 stainless steel oil filters with continuous flow transfer valve for lube oil.		X	☐
1.10.9	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 4.2.6.1 of this specification. Tubing is not allowed, except for the instruments impulse lines as per GS EP PVV 102 , GS EP INS 114 and GS EP INS 900 .		X	☐
1.10.10	All associated instrumentation	As per data sheet referenced in paragraph 5.4 and as per paragraph 4.2.4.		X	☐

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#	Item	Description	Required	Tag	Quantity
1.10.11	One local gauge panel	Made of AISI 316/316L stainless steel with instruments as per data sheet referenced in paragraph 5.4.	X		1
1.11	Synthetic lube oil system (if any) including but not limited to (as per GS EP MEC 281 and GS EP MEC 212 paragraph 4.9):				
1.11.1	Lube oil tank	Made of stainless steel AISI 316 with electrical heater.	X	1	1
1.11.2	Main lube oil pump	Shaft driven by gas generator auxiliary gear.	X	1	1
1.11.3	Hydraulic oil pump	Driven by gas generator auxiliary gear.	X	1	1
1.11.4	Scavenge oil pumps	Driven by gas generator auxiliary gear.	X	1	1
1.11.5	Lube oil cooler	As per Manufacturer standard.	X	1	1
1.11.6	Filters for lube oil	Twin oil filters made of AISI 316L stainless steel with continuous flow transfer valve for lube oil.	X	1	1
1.11.7	Filters for control oil	Twin oil filters AISI 316L stainless steel with continuous flow transfer valve for control oil.	X	1	1
1.11.8	All associated piping, piping accessories and valves	As per Manufacturer standard.	X		1
1.11.9	All associated instrumentation including chip detector	As per paragraph 4.2.4.	X		1
1.11.10	One local gauge panel	Local gauge panel frame made of AISI 316/316L stainless steel.	X		1
1.12	Seal gas system including but not limited to (as per GS EP MEC 281 and data sheet referenced in paragraph 5.4 of this specification):				
1.12.1	All associated equipment	All equipment as required by GS EP MEC 281 and associated standard P&ID.	X		1
1.12.2	All associated piping, piping accessories and valves	All associated piping, piping accessories and valves as per paragraph 4.2.6.1 of this specification. Instruments impulse lines as per GS EP PVV 102 , GS EP INS 900 and GS EP INS 114 . Heat tracing on primary seal gas lines is required as per GS EP MEC 281 part 4 paragraph 4.2.8.	X		1
1.12.3	All associated instrumentation	As per paragraph 4.2.4 of this specification and as required by GS EP MEC 281 part 4 paragraph 6, data sheet referenced in paragraph 5.4 of this specification and mounted as per GS EP PVV 102 and GS EP INS 900 .	X		1
1.12.4	Seal instrument panel	Panel frame made of AISI 316/316L supporting equipment as described in items 1.12.1, 1.12.2 and 1.12.3.	X	1	1
1.12.5	Seal gas scrubber	As per GS EP MEC 281 part 4 paragraph 4.2.8 and paragraph 4.2.6.1 of this specification.	X	1	1
1.12.6	Interconnecting piping	All interconnecting piping between seal gas panel / compressor as per paragraph 4.2.6.1 of this specification. Tubing is not allowed, except for the instruments impulse lines as per GS EP INS 101 , GS EP PVV 102 and GS EP INS 900 . Heat tracing on primary seal gas lines is required as per GS EP MEC 281 part 4 paragraph 4.2.8.	X		1
1.12.7	Vents to flare	As per GS EP MEC 281 part 4 paragraph 4.2.17.	X		1
1.12.8	Seal gas heater	As per GS EP MEC 281 part 4 paragraph 4.2.7.	1	1	1

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1.13	Baseplate including but not limited to (as per paragraph 4.2.2.1):				
1.13.1	Fabricated steel base plate	Common baseplate as per paragraph 4.2.2.1. 	X		
1.13.2	Baseplate support	3 points support 	X		
		4 temporary supports and jacking points as per paragraph 4.2.2.1.	X		
1.14	Controls & Instrumentation including but not limited to:				
1.14.1	Terminal junction boxes	All terminal junction boxes made of stainless steel AISI 316 located at skid edge as per GS EP INS 101 .	X		
1.14.2	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		
1.14.3	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		
1.14.4	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		
1.14.5	Actuated valves	All necessary control and actuated on-off valves as per GS EP PVV 821 , GS EP INS 120 and GS EP INS 137 .	X		
1.14.6	Shut down push buttons		X		
1.15	Electrical including but not limited to:				
1.15.1	Electrical cables	As per paragraph 4.2.5 of this specification, GS EP ELE 061 and GS EP ELE 161 .	X		
1.15.2	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.			
1.15.3	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		
1.15.4	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	Fuel gas liquid detection pot with associated instruments and piping including but not limited to:				
2.1.1	Skid mounted fuel gas liquid detection pot with its associated instrumentation	As per GS EP MEC 212 paragraph 5.8.1.2.1.3.	X		
2.1.2	Liquid detection pot supporting skid with its drip pan		X		
2.1.3	3-way valve or equivalent	As per GS EP MEC 212 paragraph 5.8.1.2.1.3.	X		

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#	Item	Description	Required	Tag	Quantity
2.1.4	Fuel gas calorimeter, chromatograph or Wobbe index meter	As necessary, as per GS EP MEC 212 paragraph 5.8.7.2.	X		1
2.1.5	TIT	As per GS EP MEC 212 paragraph 5.8.1.2.1.3.	X		1
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. If any, this cooler may also be used for synthetic lube oil cooling. 1	X	1	1
2.3	Valves, instruments and piping including but not limited to:				
2.3.1	Anti-surge valve, accessories and associated instrumentation	As per GS EP MEC 253 , as per GS EP PVV 112 or Project piping classes -if any-, as per GS EP PVV 821 and GS EP INS 120 .	X	1	1
2.3.2	Anti-surge control field instruments	As per GS EP MEC 253 , GS EP INS 101 , GS EP PVV 102 , GS EP INS 900 , as per approved Project Vendor list. Inline flow meters to be flanged body.	X		1
2.3.3	Flame arrestors	As per paragraph 4.2.6.2.	X		1
2.3.4	Compressor temporary suction strainer and associated spool	As per GS EP MEC 292 and GS EP MEC 251 .	X	1	1
2.3.5	PDT	For temporary suction strainer DP monitoring.	X		1
2.3.6	Interconnecting piping between the fire fighting system and the main base plate	As per GS EP PVV 112 or Project piping classes -if any-.	X		1
2.3.7	Temperature transmitter	Temperature transmitter to monitor compressor discharge pressure, as per GS EP MEC 251 .	X		1
2.4	Controls and instrumentation including but not limited to:				
2.4.1	UCP	As per GS EP INS 110 , including separate PLCs for control/safety and F&G, panel mounted HMI. Full licenses for all software.	X	1	1
2.4.2	ICSS interface	Communication cards, relays, signal convertors, etc. to interface with ICSS and support systems (if any).	X		1
2.4.3	Shut down push button	Mounted on the UCP.	X		1
2.4.4	VTMS	Vibration and Temperature Monitoring System to control the complete shaft line vibration and temperature sensors integrated inside UCP.	X	1	1
2.4.5	Anti surge control	Software and panel-mounted hardware to control the compressor anti-surge system following GS EP MEC 253 , integrated inside UCP. Full licenses for all software.	X		1
2.4.6	Load sharing control	Software and panel-mounted hardware to control the compressors load sharing, integrated inside the UCP.	X		1
2.4.7	Low voltage switchgear	Low voltage switchgear (dedicated to package low voltage auxiliaries) as per GS EP ELE 135 .	1		1

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#	Item	Description	Required	Tag	Quantity
2.5	Electrical				
2.5.1	DC uninterruptible power system	As per GS EP ELE 151 and Appendix 3 of GS EP ELE 001 .	☐		☐
2.5.2	Electrical distribution panel	Eex"d" electrical distribution panel, located in electrical room, dedicated to the post lube cool down, as per GS EP MEC 212 paragraph 5.4.6.1 and as per GS EP ELE 137 .	X		☐
2.6	Spare parts and special tools including but not limited to:				
2.6.1	Spare parts for commissioning and start-up	Detailed scope is given in paragraph 8.1.1.	X		1 set
2.6.2	Capital spare parts	Detailed scope is given in the paragraph 8.1.2.	X		1 set
2.6.3	Special tools	Detailed scope is given in the paragraph 8.2.	X		1 set
2.7	Fire fighting system				
2.7.1	Fire fighting skid	As per GS EP SAF 050 .	X		☐
3	MISCELLANEOUS				
3.1	Baseplate anchors and shims	As per paragraph 4.2.2 and Appendix 2.	X		☐
3.2	Off skid equipment anchors and shims	All anchors and shims for all off skid equipment supplied by Vendor.	X		☐
3.3	Piping	All necessary on-skid tubing / piping.	X		☐
3.4	Documentation	Set of documents as per Appendix 3.	X		1 set
3.5	Package 3D model review	Review of the turbocompressor package 3D models for maintenance areas review as per paragraph 4.2.10.	X		1
3.6	Maintenance laptop	Including software for UCP configuration.	X		☐
3.7	Personal protection	As per paragraph 4.2.8.1.	X		☐
3.8	Painting and coating	As per paragraph 4.2.7.	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.	X		☐
3.11	Earthing network	Earthing design and implementation as per GS EP ELE 031 or GS EP ELE 032 and GS EP INS 115 .	X		☐
3.12	Cleaning system washing cart	Mobile washing trolley for gas turbine compressor cleaning.	X		1
3.13	Oil conditioner	Mobile trolley as per GS EP MEC 212 paragraph 4.9.5.	X		1
3.14	Walkways and ladders	Walkways and ladders to make access to any equipment mounted on the package.	☐		☐
3.15	Lifting tools for the complete package	Consists of slings, shackles, and spreader bar as per paragraph 4.2.2 of this specification and as per GS EP STR 103 .	X		☐ set(s)

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#	Item	Description	Required	Tag	Quantity
3.16	Backup	Complete backup hard disk with application software, PLC program, HMI and any firmware prior to shipment.	X		1
3.17	Software	OEM CD/DVD for any software used with full licenses.	X		1
3.18	Specific climate considerations	☐ Tropicalization ☐ Winterization ☐ None	X		1
3.19	Tagging	Tagging as per GS EP DEV 001 .	X		
3.20	Anti-surge valve cradle	Cradle to support anti-surge valve during construction activities.	X		1
4	TESTS				
4.1	Factory tests				
4.1.1	Gas turbine	As per GS EP MEC 212 .	X		1
4.1.2	Gearbox (if any)	As per GS EP MEC 242 .	X		1
4.1.3	Compressor	As per GS EP MEC 251 .	X		1
4.1.4	Lube oil unit(s) and lube oil cooler(s)	As per GS EP MEC 281 part 1 paragraph 7.3 and part 2 paragraph 7.3.	X		1
4.1.5	Seal gas panel	As per GS EP MEC 281 part 1 paragraph 7.3 and part 4 paragraph 7.3.	X		1
4.1.6	UCP	As per paragraph 7 of this specification and GS EP INS 110 , including communication test with the ICSS.	X		1
4.1.7	Actuated valve(s)	As per GS EP INS 120 (control). As per GS EP INS 137 (on-off).	X		1
4.1.8	Complete unit tests	As per paragraph 7.	X		1
4.1.9	Noise and vibration tests	As per paragraph 7.	X		1
4.1.10	Fire protection test	As per GS EP MEC 212 paragraph 6.3.5.13.	X		1
4.1.11	Package lifting test	As per paragraph 4.2.2.	X		1
4.2	Site acceptance tests				
4.2.1	Complete unit tests	As per paragraph 7.	X		1
4.2.2	Fire suppression system test	As per GS EP SAF 050 .	X		1

3.2 Exclusions

The following equipment are 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 compressor companion flanges in Vendor's scope)
- All piping outside the package (except the interconnecting piping between the off skid fire fighting skid and the main base plate to be supplied by Vendor)
- 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 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 212				
Paragraph	Data Sheets	Project		
4.1.3	X			
4.1.8		Maximum allowable emissions level: ☐		
4.1.10		Refer to paragraph 4.2.8.2 of this specification for acceptance criteria and paragraph 7 of this specification for testing.		
4.1.17		Refer to paragraph 7 of this specification.		
4.1.19	X	Installation type: ☐ Indoors heated ☐ Indoors unheated ☐ Outdoors with a roof ☐ Outdoors without a roof		
		Environmental conditions are reported in paragraph 6 of this specification.		
4.2.7.1		Refer to paragraph 4.2.6 of this specification.		
4.4.1	X	Refer to Project station layout.		
4.7.3.1		Data allowing a torsional analysis from a third party	☐ Required	☐ Not required
4.7.5.2.1		Refer to paragraph 7.8 of this specification.		
4.10.1.1	X	Environmental conditions are reported in paragraph 6 of this specification.		
4.10.1.14.2	X	Additional PMI testing:		
5.1.1.1	X	Starting or helper driver:	☐ Required	☐ Not required
		Driver type (when required):		

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Paragraph	Data Sheets	Project
5.1.1.6	X	Refer to Project Documents in paragraph 2 of this specification.
5.2.2.4		Refer to paragraph 4.2.3.2 of this specification.
5.3.2.1		Refer to paragraph 3.1 of this specification.
5.3.2.4		Refer to paragraph 4.2.2 of this specification.
5.4.1.1		Refer to paragraph 2 of this specification.
5.4.1.5.3		Refer to paragraph 2 of this specification.
5.4.5.3.2		Control and instrumentation wiring: ☐ Armored cable ☐ Metal conduit
5.6.1.1		Anti-icing system: refer to 5.6.1.7. Emission control system: refer to 5.8.7.2.
5.6.1.6	X	Refer to paragraph 3.1 of this specification.
5.6.1.7	X	Anti-icing system: ☐ Required ☐ Not required
5.6.1.8		Refer to paragraph 6 of this specification.
5.6.1.9.1		a) sodium (Na)
		b) potassium (K)
		c) calcium (Ca)
		d) chloride (Cl-)
		e) sulphate (SO4)
		f) nitrate (NO3-)
		g) trace metals (e.g., V, Pb, Ni, Zn)
		h) sulphur dioxide (SO2)
		i) ammonia (NH3)
		j) nitrous oxide (NOx)
		k) hydrocarbons (VOC)

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Paragraph	Data Sheets	Project	
		l) hydrogen sulphide (H ₂ S)	
		m) chlorine gas (Cl ₂)	
		n) hydrochloric acid (HCl)	
		o) neon (Ne)	
		p) ozone (O ₃)	
		q) helium (He)	
		r) methane (CH ₄)	
		s) krypton (Kr)	
		t) hydrogen (H ₂)	
		u) nitrous oxide (N ₂ O)	
		v) carbon monoxide (CO)	
		w) xenon (Xe)	
		x) nitrogen dioxide (NO ₂)	
5.6.1.9.2		Refer to Project station layout.	
		Potential source of contaminants	Distance
		1. sea water, coastal water	
		2. dry lake beds	
		3. roads with heavy traffic	
		4. cooling towers at site close to the GT plant	
		5. petrochemical industry	
		6. fossil fired power plants	
		7. general chemical industry	

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GS EP MEC 212

Paragraph	Data Sheets	Project		
		8. paper and pulp industry		
		9. cement production, quarries		
		10. agricultural activities		
		11. production of fertilizers		
		12. mining and metallurgical activities		
		Potential contaminants	Quantity	
		1. water spray, NaCl		
		2. NaCl		
		3. Particulates, VOC, SO ₂ , NO _x , chlorides		
		4. drift, thermal plume		
		5. sulphur compounds, VOC		
		6. fly ash, coal dust, SO ₂		
		7. SO ₂ , HCl, H ₂ S, NH ₃		
		8. fibers, SO ₂ , H ₂ S		
		9. CaCO ₃ , SiO ₂		
		10. particulates, nitrates, phosphates, seeds, insects, pollen		
		11. ammonia, phosphates, nitrates, calcium		
		12. particulates		
5.6.1.11	X	Refer to 5.6.1.9.1 and 5.6.1.9.2 and paragraph 6 of this specification.		
5.6.1.16		On-line washing system:	☐ Required	☐ Not required

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Paragraph	Data Sheets	Project
5.6.2.1.9		Refer to paragraph 3.1 of this specification.
5.6.2.6.2.1	X	Evaporative cooler is not applicable
5.6.2.6.2.1	X	Air inlet cooler heat exchanger is not applicable
5.6.2.6.2.3	X	Air inlet cooler heat exchanger is not applicable
5.6.3.1.5	X	Exit stack supporting: ☐ Required ☐ Not required
5.6.3.2.3		Refer to paragraph 3.1 of this specification.
5.7.1.2		Refer to paragraph 4.2.8 of this specification.
5.7.4.1		Refer to paragraph 3.1 of this specification.
5.7.4.2	X	Sound restrictions: ☐ Yes ☐ No
		Sound "far field" or neighborhood restriction level:
5.7.5.1		Refer to paragraph 4.2.3.1 of this specification.
5.7.5.3.1		Refer to paragraph 4.2.3.1 of this specification.
5.7.5.6		Refer to paragraph 4.2.3.1 of this specification.
5.8.1.1	X	
5.8.1.2.1.3		Fuel gas compression system: ☐ Required ☐ Not required
5.8.2.2.1	X	Concentration of contaminants:
		Tar, carbon black and coke:
		Water:
		Solids:
		Naphtalene and gas hydrates:
5.8.2.3.1	X	Hydrogen sulphide:
		Sulfur dioxide:

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Paragraph	Data Sheets	Project		
		Sulfur trioxide:		
		Total sulfur:		
		Alkali metals:		
		Chlorides:		
		Carbon monoxide:		
		Carbon dioxide:		
5.8.2.4.1	X			
5.8.3.14	X	Liquid fuel heating system:	☐ Required	☐ Not required
5.8.3.15	X	Liquid fuel transfer equipment:	☐ Required	☐ Not required
5.8.4.3.1	X	ASTM fuel grade:		
5.8.4.3.2	X	ASTM fuel grade:		
5.8.4.3.3	X			
5.8.5.1	X	Single fuel system.		
5.8.7.1		Refer to paragraph 3.1 of this specification.		
5.8.7.1		Emission suppression system	☐ Required by local country regulation	☐ Not required by local country regulation
5.8.7.2		Continuous emission level monitoring	☐ Required by local country regulation	☐ Not required by local country regulation
5.8.7.4	X	Wet suppression system:	☐ Required	☐ Not required
6.3.5.2		Refer to paragraph 7 of this specification.		
6.3.5.2.1		Refer to paragraph 7 of this specification.		
6.3.5.2.2	X	Torsional vibration measurements	☐ Required	☐ Not required
6.3.5.4		Refer to paragraph 4.2.8.2 of this specification.		

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GS EP MEC 212

Paragraph	Data Sheets	Project
6.3.5.14		List of extra tests and inspections:
6.3.6		Refer to paragraph 7.7 of this specification.

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 4.2.8.2 of this specification for the maximum allowable sound pressure level.
2.1.10		Refer to paragraph 4.2.1 of this specification.
2.1.14	X	Refer to paragraph 6 of this specification.
2.1.16	X	

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GS EP MEC 242

Paragraph	Data Sheets	Project
3.1	X	List of accessories to be supplied:
4.1.1	X	
4.3.2.2.16		Additional speeds to be tested:
		Duration and data to be recorded:
5.3.1.1		Refer to Appendix 3 of this specification.
5.3.3		Refer to Appendix 3 of this specification.

GS EP MEC 251

Paragraph	Data Sheets	Project
Part 1		
2.2		Refer to paragraph 1.3 of this specification.
4.4.1.1.1	X	
4.4.1.1.2	X	
4.4.1.6	X	Refer to paragraph 2 and paragraph 4.2.1 of this specification.
4.4.1.9		Installation type:
		Environmental conditions are reported in paragraph 6 of this specification.
4.4.1.10		Control of sound pressure level method:
4.4.5		Refer to paragraph 4.2.1 of this specification.
4.5.1.3	X	
4.5.1.15	X	
4.5.1.19.3	X	

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GS EP MEC 251

Paragraph	Data Sheets	Project
4.7.5	X	
4.10.1.2	X	
5.1.5		Not applicable.
5.1.6		Refer to paragraph 4.3 of this specification.
5.4.1.1		Refer to paragraph 4.2.2.1 of this specification.
5.4.2.1		Refer to paragraph 4.2.2.1 of this specification.
5.4.2.11		Refer to paragraph 4.2.2.1 of this specification.
5.4.3		Refer to paragraph 4.2.2.1 of this specification.
5.5.1.5		Refer to related instrumentation specifications referenced in paragraph 2 of this specification.
5.5.2.1		Refer to paragraph 4.2.4.2 of this specification.
6.3.5.9	X	
6.3.7.2.1		Refer to paragraph 7 of this specification.
6.3.7.7		Refer to paragraph 7 of this specification.
6.4.3.12		Rotor vertical storage: ☐ Yes ☐ No
7.1.1		Refer to Appendix 3 of this specification.
Part 2		
4.10.2	X	
6.3.3		Refer to paragraph 7 of this specification.
6.3.3.1.3	X	
6.3.3.1.5	X	
6.3.3.2		Refer to paragraph 7 of this specification.

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GS EP MEC 253

Paragraph	Data Sheets	Project
Part 1		
5.2		Anti-surge controller supplier:

GS EP MEC 281

Paragraph	Data Sheets	Project
Part 1		
4.5.2	X	Environmental conditions are reported in paragraph 6 of this specification.
4.6.2		List of additional inspections required:
5.1.2		Refer to paragraph 4.2.6.1 of this specification.
5.1.18	X	List of special requirements for piping, flanges, gaskets, instruments and o-rings, valves:
5.1.32	X	Valves according to Vendor CPY Standard.
5.1.33	X	Flanged gate valves according to Vendor CPY Standard.
6.2.2.2	X	
6.2.2.4	X	
6.3.3.2		Refer to paragraph 4.2.1 of this specification.
6.3.8.1	X	
6.4.2		Refer to paragraph 6 of this specification.
8.3.4		Refer to Appendix 3 of this specification
Part 2		
4.1.4	X	