	TECHNICAL SPECIFICATION		Nr: I-ET-3010.1M-5134-323-P4X-001
	CLIENT:	SRGE	SHEET: 1 of 20
	PROGRAM:	REFERENCE BASIC DESIGN	1001056398 0010
	AREA:	BUZIOS	
DP&T-SRGE	TITLE: INSTRUMENT AND SERVICE AIR COMPRESSION UNITS		NP-1
			ESUP

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REVISION INDEX

REV.	DESCRIPTION AND/OR REVISED SHEETS
0	ORIGINAL ISSUE

	REV. 0	REV. A	REV. B	REV. C	REV. D	REV. E	REV. F	REV. G	REV. H
DATE	JAN/04/19								
PROJECT	ESUP								
EXECUTION	KALINO								
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TITLE:


**INSTRUMENT AND SERVICE AIR
COMPRESSION UNITS**

NP-1

ESUP

SUMARY

1. INTRODUCTION	3
2. NORMATIVE REFERENCES	3
3. DEFINITIONS AND ABBREVIATIONS	6
4. DESIGN REQUIREMENTS GENERAL FUNCTIONAL REQUIREMENTS	7
5. PACKAGE SPECIFICATION.....	9
6. NAMEPLATES	16
7. TAG NUMBERING	17
8. CERTIFICATION REQUIREMENTS	17
9. INSPECTION, TESTING AND COMMISSIONING	18
10. PACKAGER/MANUFACTURER RESPONSIBILITY.....	19
11. PREPARATION FOR SHIPMENT	20

	TECHNICAL SPECIFICATION	Nr: I-ET-3010.1M-5134-323-P4X-001	REV. 0
			SHEET 3 OF 20
	TITLE: INSTRUMENT AND SERVICE AIR COMPRESSION UNITS		NP-1

1. INTRODUCTION

This specification covers the minimum requirements for design, engineering, materials, fabrication, inspection, testing, pre-commissioning and commissioning of INSTRUMENT/SERVICE AIR COMPRESSION UNITS and AIR DRYING UNITS for operation on the Reference Basic Design.

The package is composed by the following items:

TAG	DESCRIPTION	QUANTITY	LOCATION
UC-5134501A/C	INSTRUMENT / SERVICE AIR COMPRESSION UNITS	3 X 50%	HULL
UA-5134501A/C	AIR DRYING UNITS	3 X 50%	HULL

2. NORMATIVE REFERENCES

All equipment shall comply with the requirements of this technical specification, data sheets, documents as stated below and with referred to herein.


2.1 CLASSIFICATION

PACKAGER/MANUFACTURER shall perform the work in accordance with the requirements of Classification Society. PACKAGER/ MANUFACTURER is responsible for submitting to the Classification Society all documentation in compliance with stated Rules.

2.2 CODES AND STANDARDS

The latest issue of the references shall be used unless otherwise agreed. Other recognized standards may be used, provided they meet or exceed the requirements of the standards referenced below. PACKAGER/MANUFACTURER shall be responsible for ascertaining the applicability of any standard or code. The PACKAGER/MANUFACTURER shall, in case of conflict between codes, standards, other project specifications and this specification revert to PURCHASER for clarification.

API RP 582	– Welding Guidelines for the Chemical, Oil, and Gas Industries
ASME VIII (Division 1)	– Boiler and Pressure Vessel Code
ASME B31.3	– Process Piping
ASME B16.5	– Pipe Flanges and Flanged Fittings
ASME IX	– Welding and Brazing Qualifications
AWS D1.1	– Structural Welding Code - Steel
IEC 60034	– Rotating Electrical Machines
IEC 61892	– Mobile and Fixed Offshore Units – Electrical Installations – All parts
IEC 60092-502	– Electrical Installation in Ships – Tankers – Special Features
ISO 8573	– Compressed Air: Part 1 Contaminants and Purity Classes

	TECHNICAL SPECIFICATION	Nr: I-ET-3010.1M-5134-323-P4X-001	REV. 0
			SHEET 4 OF 20
	TITLE: INSTRUMENT AND SERVICE AIR COMPRESSION UNITS		NP-1

2.3 GOVERNAMENTAL REGULATION


CONAMA	- Brazilian Environment Ministry (Resolution 393/2007)
NR 10	- Brazilian Ministry of Labor (Ministério do Trabalho e Emprego – Norma Regulamentadora N° 10, Segurança em Instalações e Serviços em Eletricidade)
NR 13	- Brazilian Ministry of Labor (Ministério do Trabalho e Emprego – Norma Regulamentadora N° 13, Pressure Vessels and Boiler Regulations)
NR 26	- Brazilian Ministry of Labor (Ministério do Trabalho e Emprego – Norma Regulamentadora N° 26, Sinalização de Segurança)
NR 30	- Brazilian Ministry of Labor (Ministério do Trabalho e Emprego – Norma Regulamentadora N° 30, Segurança e Saúde no Trabalho Aquaviário – Anexo 2)
NR 37	- Brazilian Ministry of Labor (Ministério do Trabalho e Emprego – Norma Regulamentadora N° 37, Segurança e Saúde em Plataformas de Petróleo)

Government codes, regulations, ordinances or rules applicable to the equipment in the country where it will be installed, shall prevail over the requirement of above specification, including reference codes and standards and/ or this engineering specification, only in those cases where they are more stringent.

2.4 REFERENCE DOCUMENTS

PACKAGER/MANUFACTURER shall take into account the following referenced Documents, on the latest revision, where applicable. PACKAGER/MANUFACTURER documents shall provide a detailed description of the equipment and scope of supply, as well as all associated technical requirements. All equipment parts and details not complying with the specifications below shall be informed on a “Deviation List”. Otherwise they will be considered as “Agreed”, and so required.

I-ET-3A36.00-1000-941-PPC-001_D	METOCEAN DATA
I-ET-3000.00-1200-940-P4X-001	TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN
I-ET-3000.00-0000-940-P4X-002	SYMBOLS FOR PRODUCTION UNITS DESIGN
I-ET-3010.00-5400-947-P4X-002	SAFETY SIGNALLING
I-ET-3010.00-1200-956-P4X-002	GENERAL PAINTING
I-ET-3010.00-1200-956-P4X-001	QUALIFICATION TESTS FOR PAINT SYSTEMS
I-ET-3010.00-1200-540-P4X-001	REQUIREMENTS FOR PRESSURE VESSELS DESIGN
I-ET-3010.00-1200-540-P4X-002	REQUIREMENTS FOR PRESSURE VESSEL FABRICATION
I-RL-3010.1M-1350-960-P4X-009	MOTION ANALYSIS


	TECHNICAL SPECIFICATION	Nr: I-ET-3010.1M-5134-323-P4X-001	REV. 0
			SHEET 5 OF 20
	TITLE: INSTRUMENT AND SERVICE AIR COMPRESSION UNITS		NP-1

I-DE-3010.1M-5134-944-P4X-001	INSTRUMENT/SERVICE AIR SYSTEM
I-FD-3010.1M-5134-323-P4X-001	INSTRUMENT/SERVICE AIR COMPRESSION UNIT (UC-5134001A/C)
I-ET-3010.1M-1200-300-P4X-002	NOISE CONTROL REQUIREMENTS FOR ACCOMMODATION/HULL
I-ET-3010.00-5140-712-P4X-001	LOW-VOLTAGE INDUCTION MOTORS FOR OFFSHORE UNITS
I-ET-3010.00-5140-700-P4X-001	SPECIFICATION FOR ELECTRICAL DESIGN FOR OFFSHORE UNITS
I-ET-3010.00-5140-700-P4X-002	SPECIFICATION FOR ELECTRICAL MATERIAL AND EQUIPMENT FOR OFFSHORE UNITS
I-ET-3010.00-5140-700-P4X-005	REQUIREMENTS FOR HUMAN ENGINEERING DESIGN FOR ELECTRICAL SYSTEMS OF OFFSHORE UNITS
I-ET-3010.00-5140-741-P4X-001	LOW-VOLTAGE MOTOR CONTROL CENTER AND SWITCHGEAR FOR OFFSHORE UNITS
I-LI-3010.00-5140-797-P4X-001	ELECTRICAL SYSTEM AUTOMATION INTERFACE SIGNALS LIST
I-LI-3010.00-5140-700-P4X-001	ELECTRICAL EQUIPMENT DATA-SHEET MODELS
I-ET-3010.00-5140-700-P4X-003	ELECTRICAL REQUIREMENTS FOR PACKAGES FOR OFFSHORE UNITS
I-ET-3010.1M-1200-800-P4X-005	FIELD INSTRUMENTATION
I-ET-3000.00-1200-800-P4X-002	AUTOMATION, CONTROL AND INSTRUMENTATION ON PACKAGED UNITS
I-ET-3010.00-5520-888-P4X-001	CSS / SOS PANELS
I-ET-3010.1M-1200-200-P4X-001	PIPING SPECIFICATION FOR TOPSIDE
I-ET-3010.1M-1200-200-P4X-002	PIPING SPECIFICATION FOR HULL

2.5 CONFLICTING REQUIREMENTS

In case of conflicting information between this technical Specification (ET) and the referred applicable standards, this ET shall prevail.

In all cases of conflict between this specification and applicable documents listed herein, the more stringent requirements shall prevail. In such cases, PACKAGER/MANUFACTURER shall inform PURCHASER of the conflict and seek clarification.

	TECHNICAL SPECIFICATION	Nr: I-ET-3010.1M-5134-323-P4X-001	REV. 0
			SHEET 6 OF 20
	TITLE: INSTRUMENT AND SERVICE AIR COMPRESSION UNITS		NP-1

2.6 CLASS APPROVAL AND CERTIFICATION

The FPSO hull is to be classified according to Classification Society Guide for Building and Classing Floating Production Installations.

Equipment certification and approval as required by the above rules is PACKAGER/MANUFACTURER's responsibility. PACKAGER/MANUFACTURER shall communicate directly with Classification Society and provide all documentation necessary to obtain approvals. PURCHASER shall be copied on all correspondence between PACKAGER/MANUFACTURER and Classification Society. PACKAGER/MANUFACTURER shall obtain approval for all parts of their work as required by Classification Society before shipment of the equipment to the shipyard.

3. DEFINITIONS AND ABBREVIATIONS

3.1 DEFINITIONS

CAN: requirements are conditional and indicate a possibility open to the user of the standard.

MAY: indicates a course of action that is permissible within the limits of the standard (a permission).

SHALL: is an absolute requirement, which shall be followed strictly in order to conform with the standard.

SHOULD: is a recommendation. Alternative solutions having the same functionality and quality are acceptable.


PACKAGER: Company responsible for the project, assembly, construction, fabrication, test and furnishing of the Package.

MANUFACTURER: The supplier, vendor or Contractor. Company responsible for the fabrication of equipment or components internal to the Package.

PURCHASER: Company designated as such in the contract or the purchase order.

3.2 ABBREVIATIONS

- ASTM - American Society for Testing and Materials
- dB(A) - A weighted noise level measured in decibels
- FAT - Factory Acceptance Test
- FPSO - Floating Production Storage and Offloading

	TECHNICAL SPECIFICATION	Nr: I-ET-3010.1M-5134-323-P4X-001	REV. 0
			SHEET 7 OF 20
	TITLE: INSTRUMENT AND SERVICE AIR COMPRESSION UNITS		NP-1

4. DESIGN REQUIREMENTS GENERAL FUNCTIONAL REQUIREMENTS

The air compressor and air drying units shall be provided with all necessary instruments to operate safely, adequately and without interruption in a tropical marine environment.

PACKAGER/MANUFACTURER shall be responsible for the complete design, fabrication, inspection, testing, and supply of the components and spares, in full compliance with the requirements of this specification, its attachments and all applicable codes, standards and regulations referenced and, where applicable, the requirements of the Classification Society.

4.1 DESIGN LIFE

Equipment shall be designed for a 25-year life in a corrosive offshore environment without the need for replacement of any major component due to wear, corrosion, fatigue, or material failure.

PACKAGER/MANUFACTURER shall include a schedule stating the expected time between major overhauls.

4.2 DESIGN CONDITIONS

PACKAGER/MANUFACTURER shall design the equipment for the full range of operational conditions as specified in the I-DE-3010.1M-5134-944-P4X-001 (INSTRUMENT/SERVICE AIR SYSTEM), I-FD-3010.1M-5134-323-P4X-001 - INSTRUMENT/SERVICE AIR COMPRESSION UNIT (UC-5134001A/C).


Electrical equipment shall be manufactured and tested in compliance with Classification Society and IEC requirements, unless otherwise stated.

4.3 EQUIPMENT LOCATION

The air compression and dryer package will be installed at 3rd deck of the engine room. Internal temperature of this room will be 40°C, to be achieved by the ventilation system. Each air compressor and dryer units shall be mounted on a common baseplate with all necessary ancillaries to operate safely, providing adequate clearance for safety and maintenance.

Packages shall be designed and fabricated such that all equipment and components are located entirely within the skid base perimeter, including all equipment, piping, valves, electrical, instrumentation and controls.

Package layout and arrangement shall be designed to provide sufficient access for ease of operability and maintenance, and to maximize safety. The projection of such items beyond the perimeter of the skid base shall be strictly prohibited, unless approved in writing by PURCHASER.

	TECHNICAL SPECIFICATION	Nr: I-ET-3010.1M-5134-323-P4X-001	REV. 0
			SHEET 8 OF 20
	TITLE: INSTRUMENT AND SERVICE AIR COMPRESSION UNITS		NP-1

4.4 SAFETY REQUIREMENTS

Personnel safety protection shall be provided according to Regulatory Standards (NR) by Brazilian Ministry of Labor.

Warning signs in Brazilian Portuguese language shall be provided where risk of personnel injury exist.

Rotating equipment outer parts, such as pulleys, couplings, belts and flywheels, shall have rigid protection, manufactured with aluminum ASTM B211 and shall be capable of being easily removed.

Safety Signalling shall be in full compliance with I-ET-3010.00-5400-947-P4X-002 (SAFETY SIGNALLING).

4.5 NOISE AND VIBRATIONS

Noise and vibrations limits shall be conform to I-ET-3010.1M-1200-300-P4X-002 – NOISE CONTROL REQUIREMENTS FOR ACCOMMODATION/HULL. Noise data is required for the final proposal and after the FAT.

Any protections hoods used for noise reduction should be made of stainless steel (304L or 316L).

The maximum sound level at any location 1m from the equipment shall not exceed 85 db(A). This is applicable to all of the operating conditions for which the equipment is used.

4.6 ENVIRONMENTAL CONDITIONS

The equipment supplied shall be suitable for the environment and range of ambient conditions defined in the I-ET-3A36.00-1000-941-PPC-001_D (METOCEAN DATA).


4.7 MOTIONS AND ACCELERATION

INSTRUMENT/SERVICE AIR COMPRESSION UNIT is defined as “Essential Equipment” according to CS and IMO MODU CODE requirements.

All equipment shall be able to withstand and to operate when the Unit is subjected to 100-year return period environmental conditions defined in I-ET-3A36.00-1000-941-PPC-001_D METOCEAN DATA, at any draft from fully loaded to 20% loaded/ballasted condition, and under inclination (static and dynamic) as specified by the Classification Society Rules for Building and Classing Steel Vessel.

For design data on motion requirements, see I-RL-3010.1M-1350-960-P4X-009 – MOTION ANALYSIS.

The equipment is also to withstand inertial forces during transportation from construction site to operation site (onshore or offshore).

	TECHNICAL SPECIFICATION	Nr: I-ET-3010.1M-5134-323-P4X-001	REV. 0
			SHEET 9 OF 20
	TITLE: INSTRUMENT AND SERVICE AIR COMPRESSION UNITS		NP-1

4.8 MECHANICAL REQUIREMENTS

It is the responsibility of PACKAGER/MANUFACTURER ensures the layout of all equipment and components are conducive to efficient and safe operation. Routine maintenance and removal of components and subassemblies requiring periodic replacement or overhaul shall, wherever possible, be achieved without dismantling adjacent equipment.


5. PACKAGE SPECIFICATION

Package layout and arrangement shall be designed to provide sufficient access for ease of operability and maintenance, and to maximize safety. Packages shall be designed and fabricated such that all equipment and components are located entirely within the skid base perimeter, including all equipment, piping, valves, electrical, instrumentation and controls. The projection of such items beyond the perimeter of the skid base shall be strictly prohibited, unless approved in writing by PURCHASER.

5.1 PACKAGER'S SCOPE OF SUPPLY

PACKAGER's scope of supply shall include, but not necessarily be limited to the following major equipment:

- Three (3) x 50% INSTRUMENT/SERVICE AIR COMPRESSION UNITS with three (3) x 50% AIR DRYING UNITS, comprising at least:
 - Three (3) identical oil free rotary screw compressors, in a 3 x 50% configuration (INSTRUMENT/SERVICE AIR COMPRESSOR). The called compressor mainly comprises the compressor itself, intercoolers and after-coolers;
 - Three (3) identical dry-type air intake filters (INSTRUMENT/SERVICE AIR COMPRESSOR AIR INTAKE FILTER), installed upstream the compressors (one air intake filter for each compressor);
 - Three (3) shell and tube heat exchanger (INSTR./SERV. AIR COMP. UNIT AFTER COOLER);
 - Three (3) shell and tube heat exchanger (INSTR./SERV. AIR COMP. UNIT INTERCOOLER);
 - Six (6) of self-regenerating adsorption type air dryers (AIR DRYER), two for each compressor;
 - Six (6) cartridge type air filters (AIR DRYING UNIT PRE-FILTER) installed upstream the air dryer (one pre filter for each air dryer);
 - Six (6) cartridge type air filters (AIR DRYING UNIT AFTER-FILTER) installed downstream the air dryer (one after filter for each air dryer);
- Three (3) Variable Speed Driver - frequency converters - FREQUENCY CONVERTER FOR INSTRUMENT/SERVICE AIR COMPRESSOR);

	TECHNICAL SPECIFICATION	Nr: I-ET-3010.1M-5134-323-P4X-001	REV. 0
			SHEET 10 OF 20
	TITLE: INSTRUMENT AND SERVICE AIR COMPRESSION UNITS		NP-1

- Three (3) local control panels - INST./SERV. AIR COMPRESSION UNIT CONTROL PANEL);
- Skids with drip pans, lifting lugs, earthing lugs;
- All on skid electrical and instrumentation installation and interconnecting piping, fittings and valves;
- Flanged drains and vents with valves.

Each air compression and air drying unit shall be mounted on a common baseplate.

5.2 PACKAGE

The complete package shall be designed, manufactured, tested, inspected and certified in accordance with the requirements of this specification and be designed to meet the duty as stipulated on the project data sheets.

Each air compressor and dryer package shall be mounted on a common baseplate, providing adequate clearance for safety and maintenance.

All PURCHASER piping connections shall be located at the skid edge and provided with flanged connections according to ASME B16.5 and I-ET-3010.1M-1200-200-P4X-002 PIPING SPECIFICATION FOR HULL. Locations, size and rating of all PURCHASER connections shall be clearly defined by PACKAGER.

PACKAGER shall assume full unit responsibility for the complete package, including the driver and all ancillaries.

The utility requirements and consumption of the equipment shall be clearly defined by PACKAGER. This information shall also be included in the technical proposal.


The packages, including all ancillary equipment, shall be assembled to the maximum extent possible, aligned and pre-checked in PACKAGER/MANUFACTURER'S shop, allowing shipment to the conversion yard with minimal fieldwork.

The package(s) shall be manufactured, inspected, and verified to comply with all specifications mentioned in Section 2 and the Classification Society regulations.

Dissimilar materials shall be isolated to avoid galvanic corrosion.

All pressure vessels shall conform to the requirements of NR-13 and ASME Sec.VIII Div.1, if applicable.

Air compressor unit and air dryer unit shall be provided with lugs to facilitate mechanical handling by means of a single point lift.

 PETROBRAS	TECHNICAL SPECIFICATION	Nr: I-ET-3010.1M-5134-323-P4X-001	REV. 0
			SHEET 11 OF 20
	TITLE: INSTRUMENT AND SERVICE AIR COMPRESSION UNITS		NP-1

5.3 AIR COMPRESSOR

INSTRUMENT/SERVICE AIR COMPRESSOR shall be oil free rotary screw type, driven by electric motors with variable speed driver – frequency converter.

Air shall be delivered for proper dew point in accordance with the data sheet I-FD-3010.1M-5134-323-P4X-001 - INSTRUMENT/SERVICE AIR COMPRESSION UNIT(UC-5134001A/C).

The INSTRUMENT/SERVICE AIR COMPRESSOR shall be provided with a load control system responsible for compressor's running.

The compressor performance shall be compliance with its Data Sheet.

Each compressor including intercooler, aftercooler, filters, dryer, auxiliaries and controls are to be built on a skid, in a sound reducing enclosure for indoor installation. Ingress protection shall be at least IP 44.

5.3.1. Rotating Elements

Shaft sleeves shall be provided under all shaft sealing areas. Major parts of rotating elements shall be individually, dynamically balanced. Each rotor shall be dynamically balanced in an assembled condition.

Rotors shall be designed with the first lateral critical speed at least 20 percent above the maximum operating speed.

5.3.2. Bearings

Ball and roller bearing shall be provided.

5.3.3. Timing Gears

Timing gears shall be of the helical type. The rating shall be base on the electric motor nameplate power rating.

5.3.4. Couplings

Couplings, when applied shall be non-lubricated and designed to reduce torque peaks. Guards shall be manufactured from a non-sparking material.


5.3.5. Cooling System

Air compressors shall be fresh water cooled.

5.3.6. Air Intake Filters

A dry-type, air intake filter for the compressor shall be provided. The filter shall be designed for 110% of the rated air flow and removing 98 percent of particles 3 micron or larger.

5.4 AIR DRYER

	TECHNICAL SPECIFICATION	Nr: I-ET-3010.1M-5134-323-P4X-001	REV. 0
			SHEET 12 OF 20
	TITLE: INSTRUMENT AND SERVICE AIR COMPRESSION UNITS		NP-1

There will be 2 (two) sets of air drying columns for each air compressor: one in operation and one in stand-by/regenerating.

The unit shall be of self-regenerating adsorption type and drying element shall be activated alumina.

Manufacturer shall inform the necessary air flow rate to activate alumina bed regeneration. This air flow shall not be considered as part of the above specified capacity of the unit.

The operation period of drying column shall be at least 4 hours (as a minimum).

The operational sequence of the drying column shall be performed by humidity set control fitted at outlet of the unit.

5.5 PIPING

All piping shall be designed, fabricated, and inspected in accordance with ASME B31.3. Threaded connections shall not be used.

All connections shall be located at skid edge and provided with flanged connections according to ASME B16.5. Locations, size and rating of all connections shall be clearly defined by PACKAGER/MANUFACTURER.

5.6 MATERIALS

Materials of equipment construction shall be as per PACKAGER/MANUFACTURER's common standard practices, except when specified in equipment data-sheet.

5.7 PRESSURE VESSELS (DESIGN AND FABRICATION)

For pressure vessels requirements, see I-ET-3010.00-1200-540-P4X-001 REQUIREMENTS FOR PRESSURE VESSELS DESIGN and I-ET-3010.00-1200-540-P4X-002 REQUIREMENTS FOR PRESSURE VESSEL FABRICATION .


5.8 INSTRUMENTATION AND CONTROL

5.8.1. General

All instruments and controls shall be fit for purpose, suitable for marine environmental for which they are intended, according to the same standards and requirements applicable for this project.

PACKAGER/MANUFACTURER shall ensure that the equipment is properly certified for the specified classification.

The instrumentation and control design shall fulfill the requirements of I-ET-3010.00-1200-800-P4X-002 - AUTOMATION, CONTROL AND INSTRUMENTATION ON PACKAGED UNITS. The package including monitoring and control system shall be considered as a P1 package.

	TECHNICAL SPECIFICATION	Nr: I-ET-3010.1M-5134-323-P4X-001	REV. 0
			SHEET 13 OF 20
	TITLE: INSTRUMENT AND SERVICE AIR COMPRESSION UNITS		NP-1

Panel and accessories shall be designed for environmental protection IP-22 when installed in air conditioned room or ventilated room (Indoor panels). See details in I-ET-3010.00-5520-888-P4X-001 - CSS / SOS PANELS.

Package unit equipment will be provided with PACKAGER/MANUFACTURER's control system and safeguarding incorporated. PACKAGER/MANUFACTURER shall assume total responsibility for the instrumentation, design, engineering, operational philosophy, and the PLC based control and safeguarding systems. These are part of PACKAGER/MANUFACTURER's scope, unless specified otherwise.

5.8.2. System Cabling

All wiring within the limits of the enclosure shall be clearly marked on the wire and at the terminal.

All cabling between the driver and the local gauge board shall be furnished.


All cables and cable routes shall contain at least 20% spares.

5.9 ELECTRICAL REQUIREMENTS

Compressor drivers shall be squirrel cage induction electric motor. All drivers shall be supplied and mounted by PACKAGER. Electronic type frequency converter devices shall be provided for motors with rated power above 110 kW. The frequency converter shall allow the soft starter of electric motor and control the compressor capacity.

Design of electrical equipment shall fulfill the requirements, including standards and documents referred to within these, in as well as referenced data sheets:

- I-ET-3010.00-5140-700-P4X-002 - SPECIFICATION FOR ELECTRICAL MATERIAL AND EQUIPMENT FOR OFFSHORE UNITS;
- I-ET-3010.00-5140-700-P4X-001 - SPECIFICATION FOR ELECTRICAL DESIGN FOR OFFSHORE UNITS
- I-ET-3010.00-5140-700-P4X-003 - ELECTRICAL REQUIREMENTS FOR PACKAGES FOR OFFSHORE UNITS;
- I-ET-3010.00-5140-700-P4X-005 - REQUIREMENTS FOR HUMAN ENGINEERING DESIGN FOR ELECTRICAL SYSTEMS OF OFFSHORE UNITS;
- I-ET-3010.00-5140-741-P4X-001 - LOW-VOLTAGE MOTOR CONTROL CENTER AND SWITCHGEAR FOR OFFSHORE UNITS;
- I-ET-3010.00-5140-712-P4X-001 - LOW-VOLTAGE INDUCTION MOTORS FOR OFFSHORE UNITS;
- I-LI-3010.00-5140-797-P4X-001 - ELECTRICAL SYSTEM AUTOMATION INTERFACE SIGNALS LIST;
- I-LI-3010.00-5140-700-P4X-001 - ELECTRICAL EQUIPMENT DATA-SHEET MODELS.

	TECHNICAL SPECIFICATION	Nr: I-ET-3010.1M-5134-323-P4X-001	REV. 0
			SHEET 14 OF 20
	TITLE: INSTRUMENT AND SERVICE AIR COMPRESSION UNITS		NP-1

Any deviations regarding these documents shall be identified in a Deviation List.

5.9.1. Electrical Power / Package Type:

Electrical installations and package electrical interfaces shall comply with requirements of I-ET-3010.00-5140-700-P4X-001 - SPECIFICATION FOR ELECTRICAL DESIGN FOR OFFSHORE UNITS, I-ET-3010.00-5140-700-P4X-003 - ELECTRICAL REQUIREMENTS FOR PACKAGES FOR OFFSHORE UNITS, I-ET-3010.00-5140-700-P4X-005 - REQUIREMENTS FOR HUMAN ENGINEERING DESIGN FOR ELECTRICAL SYSTEMS OF OFFSHORE UNITS and I-LI-3010.00-5140-797-P4X-001 - ELECTRICAL SYSTEM AUTOMATION INTERFACE SIGNALS LIST.

Electrical material and low-voltage frequency converters shall comply with I-ET-3010.00-5140-700-P4X-002 - SPECIFICATION FOR ELECTRICAL MATERIAL AND EQUIPMENT FOR OFFSHORE UNITS.

Low-voltage motors shall comply with requirements of I-ET-3010.00-5140-712-P4X-001 - LOW-VOLTAGE INDUCTION MOTORS FOR OFFSHORE UNITS.

Electrical panel shall comply with requirements of I-ET-3010.00-5140-741-P4X-001 - LOW-VOLTAGE MOTOR CONTROL CENTER AND SWITCHGEAR FOR OFFSHORE UNITS, being acceptable fixed (not withdrawable) functional units.

It shall be issued data-sheets for electrical equipment, according to templates of I-LI-3010.00-5140-700-P4X-001 - ELECTRICAL EQUIPMENT DATA-SHEET MODELS.

5.9.2. Equipment and Interconnection:

The electrical interconnection (power, control, protection, lighting, heating, etc.) between equipment located in the same Package shall be sized, purchased and installed under the complete responsibility of the Supplier.

Interconnection diagrams and cable list shall be provided by Supplier, clearly indicating which cables shall be Contractor and Supplier scope of supply.

All equipment and materials shall be suitable for service on marine and petrochemical environments, and able to withstand the severe tropical, damp and saline atmospheric local conditions.


PACKAGER/MANUFACTURER shall inform all the package loads for purpose of external design.

If the requirements are not applied to the proposed system, PACKAGER/MANUFACTURER shall indicate the deviations and explain them.

5.10 MAINTENANCE LIFTING BEAMS

All necessary maintenance lifting beams complete with the necessary hoist and lifting gear shall be provided to facilitate safe and easy maintenance.

All lifting beams shall overhang by at least 1.2 m into agreed lay-down areas.

	TECHNICAL SPECIFICATION	Nr: I-ET-3010.1M-5134-323-P4X-001	REV. 0
			SHEET 15 OF 20
	TITLE: INSTRUMENT AND SERVICE AIR COMPRESSION UNITS		NP-1

The deflection of the maintenance crane/hoisting beams shall not exceed 1/500 of the span length.

All beams and lifting gear shall be subjected to witness load testing by the PURCHASER'S representative and classification society.

5.11 SKID

The skid shall be designed to accommodate the entire equipment within the scope of supply. The skid shall be of rigid construction, which will not distort during hoisting, operation and shipment and shall withstand all moments and forces due to the vessel motion.

All structural components shall be designed in accordance with relevant rules. Lifting pad eyes shall be designed in accordance with a recognized body's Rules for Certification of Lifting Appliances. Any slings, spreaders etc provided by PACKAGER/MANUFACTURER shall be furnished with applicable certificates.

Lifting facilities shall permit the equipment to be lifted by crane as a single point lift for transportation and installation. The design and manufacture of the lifting lugs shall be certified. The arrangement of equipment, piping and superstructure shall be such that the centre of gravity coincides approximately with the geometrical centre of the skid.


The skid shall resist all sling forces, including both horizontal and vertical components of the applied sling angle (sling angles shall be within between 50 and 90 degrees with the horizontal plane)

Lifting beams, spreader bars, slings, shackles etc. are within PACKAGER/MANUFACTURER's scope of supply.

Drip trays with drain connections shall be provided underneath equipment where seriously spillage is likely to occur.

The skid shall be welded to the supporting structures. The floor shall be made of plate material with a raised on-slip tread. Welds underneath skid beams shall be ground flush. Skid shall have 2 diagonally opposed earthing bosses.

Welding shall be carried out with procedures and operators qualified in accordance with the ASME section IX. Welding shall not be performed before qualified welding procedure, etc. is approved. Intermittent fillet welds are not permitted.

	TECHNICAL SPECIFICATION	Nr: I-ET-3010.1M-5134-323-P4X-001	REV. 0
			SHEET 16 OF 20
	TITLE: INSTRUMENT AND SERVICE AIR COMPRESSION UNITS		NP-1

5.12 LAYOUT

Package layout and arrangement shall be designed to provide sufficient access for ease of operability and maintenance, and to maximize safety.

Packages shall be designed and fabricated such that all equipment and components are located entirely within the skid base perimeter, including all equipment, piping, valves, electrical, instrumentation and controls. The projection of such items beyond the perimeter of the skid base shall be strictly prohibited, unless approved in writing by PURCHASER.

5.13 MANUFACTURING

All materials and equipment shall be new and from Company's Approved Manufacturer's List. Any materials used in the fabrication of this equipment from an unapproved manufacturer will be rejected, removed and replaced at PACKAGER/MANUFACTURER's expense.

5.14 PAINTING

Painting and coating shall be in accordance with I-ET-3010.00-1200-956-P4X-002 – GENERAL PAINTING.

If PACKAGER/MANUFACTURER uses his own painting/coating specification, it shall be in accordance with I-ET-3010.00-1200-956-P4X-001 – QUALIFICATION TESTS FOR PAINT SYSTEMS and shall be submitted for PURCHASER approval.

All components shall be delivered fully painted/coated.


The performed pre-treatment and complete coating shall be of in accordance with the paint manufacturer's data sheets.

Defects arising within the guarantee period shall be subject to an allowance of 1%, representing wear and tear. For system failure in excess of this, PACKAGER/MANUFACTURER's liability shall include complete pre-treatment and repainting.

6. NAMEPLATES

The Instrument and Service Air Compression Units shall have nameplates in Brazilian Portuguese language, made of stainless steel AISI 316L, with 3 mm minimum thickness and fixed by stainless steel (AISI 316L) bolts or fasteners on visible and accessible location. Nameplates shall include at least the following information:

- Petróleo Brasileiro S.A. – PETROBRAS;
- Purchase order number;
- MANUFACTURER and year of built;
- Manufacture Year;
- Serial number;
- Main data for design, operation and testing (Power, Pressure, Volume, Temperature, Rotation, Flow rate), where applicable;

 PETROBRAS	TECHNICAL SPECIFICATION	Nr: I-ET-3010.1M-5134-323-P4X-001	REV. 0
			SHEET 17 OF 20
	TITLE: INSTRUMENT AND SERVICE AIR COMPRESSION UNITS		NP-1

- Specific requirements;
- Installation identification;
- Driver power rating and speed, where applicable;
- Equipment TAG;
- Empty Weight;
- Hydrostatic test water requirements – whenever applicable;
- Design Code;
- Service.

Valves, instruments and orifices shall be tagged with the applicable number only.

7. TAG NUMBERING

Tagging of all instruments, electrical, mechanical and piping items, including valves, shall be carried out. Tag numbers will be supplied by PURCHASER.

The main items shall have individual tag numbers as dictated by the PURCHASER. The actual tag numbers will be advised to PACKAGER/MANUFACTURER after award.

Tags shall be supplied with the number and description in the Brazilian Portuguese language, unless otherwise stated in the technical data sheets.

Valves, instruments and orifices shall be tagged with the applicable number only.

Tag numbers for remaining ancillary equipment shall be given after purchase order placement.

For tag rules, see the I-ET-3000.00-1200-940-P4X-001 – TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN.

8. CERTIFICATION REQUIREMENTS


8.1 CLASS CERTIFICATION

A Classification Society Certificate shall be supplied to attest compliance of the whole Package with the Rules requirements.

8.2 MATERIAL CERTIFICATION

PACKAGER/ MANUFACTURER shall be responsible for obtaining all necessary certification of the equipment. PACKAGER/ MANUFACTURER, through the independent certifying authority, shall supply all certificates related to the materials, inspections, tests and qualification activities detailed in the approved Quality Plan.

For pressure containing parts of equipment and main components, PACKAGER/ MANUFACTURER shall specify material properties and chemical composition of the materials used in the equipment by means of appropriated certificate.

	TECHNICAL SPECIFICATION	Nr:	I-ET-3010.1M-5134-323-P4X-001	REV.	0
				SHEET	18 OF 20
	TITLE:			NP-1	
			ESUP		

9. INSPECTION, TESTING AND COMMISSIONING

PACKAGER/MANUFACTURER shall perform all required inspection and testing in accordance with the referenced design code and/or applicable industry standards. In addition to industry codes and PACKAGER/MANUFACTURER's standards, PACKAGER/MANUFACTURER shall comply with the applicable project specifications listed herein, at data sheet and Material Requisition.

PACKAGER/MANUFACTURER shall submit the Inspection and Test Plan (ITP) based on the technical data sheet with witnessed inspections and tests identified.

PACKAGER/MANUFACTURER shall ensure that all the witnessed inspection requirements by the Classification Society are fully accommodated and the due notice requirements are satisfied. The notification period for such inspections shall be informed in advance of 4 (four) weeks for foreign MANUFACTURER and 1 (one) week for Brazilian MANUFACTURER.

PURCHASER shall be invited to participate in the FAT minimum 20 working days before scheduled test date. MANUFACTURER shall make preliminary test to ensure that all parts of the equipment are operating satisfactory prior to the arrival of the PURCHASER's representative.

If it is necessary to dismantle any equipment during a test, because of malfunction, the test may then be invalidated, and a full test shall be required after the repair of the fault.

Acceptance of shop tests shall not constitute a waiver of requirements to meet the field tests under specified operating conditions, nor shall inspection relieve MANUFACTURER of his responsibilities in any way whatsoever.

9.1 FAT


The following tests shall be included in PACKAGER/MANUFACTURER's scope:

- Hydrotest of all vessels and pipes;
- Electrical continuity checks on all wiring and earthing;
- Functional checks on all instruments and valves;

PACKAGER/MANUFACTURER shall prepare a FAT procedure for the package and submit for PURCHASER approval.

PURCHASER representatives will witness the FAT. PACKAGER/MANUFACTURER shall advise the PURCHASER of the test schedule at least 2 (two) week for Brazilian MANUFACTURERS/Sub-Suppliers and 4 (four) weeks for foreign MANUFACTURER/Sub-Suppliers before the planned test dates. PACKAGER/MANUFACTURER shall invite CLASS surveyor for FAT.

Acceptance of the FAT will not be considered as the final acceptance test of the package.

 PETROBRAS	TECHNICAL SPECIFICATION	Nr: I-ET-3010.1M-5134-323-P4X-001	REV. 0
			SHEET 19 OF 20
	TITLE: INSTRUMENT AND SERVICE AIR COMPRESSION UNITS		NP-1

10. PACKAGER/MANUFACTURER RESPONSIBILITY

It is PACKAGER/MANUFACTURER's responsibility to submit to the Classification Society the documentation in compliance with Rules in force.

Any conflict between the requirements of this specification and related codes and standards, specification etc. shall be presented in writing for PURCHASER resolution prior to manufacturing.

PACKAGER/ MANUFACTURER shall assume sole contractual and total engineering responsibility for the equipment supplied.

PACKAGER/ MANUFACTURER responsibility shall include, but not be limited to:

- Resolving all engineering questions and/or problems relating to design and manufacture.
- Providing details as requested of any Sub-Suppliers relating to design and manufacturing.
- In all cases of conflict between this specification and applicable documents listed herein, the more stringent requirements shall prevail. In such cases, PACKAGER/MANUFACTURER shall inform PURCHASER of the conflict and seek clarification.
- Commissioning & Training for operation.
- Installation at site shall be performed by others, however, presence of supervision by PACKAGER/ MANUFACTURER is required.

Compliance by PACKAGER/ MANUFACTURER with the provisions of this specification does not relieve the PACKAGER/ MANUFACTURER of his responsibility to furnish equipment and accessories of a proper mechanical design suited to meet the specified service conditions.


The technical proposal must, only and exclusively, have an explicit statement that it meets the requirements of all items of the respective Material Requisition (number and revision quoted) and its annexes, complemented by the Technical Clarification Circular Letters (number quoted), including the scope of supply, without any technical deviation.

Any exclusion and/or alternative to what is specified in the Material Requisition and its annexes, including the use of the bidders standard and exclusive technology, shall be presented in a Deviation List, which only will be accepted by PURCHASER during the clarification phase, preceding the proposal presentation.

PURCHASER acceptance of each item of the Deviation List will be through Technical Clarification Circular Letters, issued to all bidders.

The Deviation List mentioned above shall contain, at least, for each requirement that the bidder intends to change:

- The document description, code and section that contain the requirement;
- The reason for deviation, always indicating the requirements that are different from bidder's standard, and the costs, schedule and technical benefits/ impacts of the change;
- The bidder proposal.

	TECHNICAL SPECIFICATION	Nr: I-ET-3010.1M-5134-323-P4X-001	REV. 0
			SHEET 20 OF 20
	TITLE: INSTRUMENT AND SERVICE AIR COMPRESSION UNITS		NP-1

11. PREPARATION FOR SHIPMENT

11.1 MARKING

All items supplied to this specification shall be adequately marked for identification against a certificate or relevant test documentation. Marking shall be such that it will not damage or impair the component.

Items that cannot be identified shall be rejected. Rejected items may be re-certified by carrying out all relevant testing, with prior approval of PURCHASER.

As a minimum, the following identification shall be provided:

- Project Number;
- Manufacturer's Name;
- Purchase Order Number;
- Minimum Breaking Load;
- Item Number;
- Classification Society Surveyor's Stamp.

11.2 SHIPMENT PACKING

Shipment packing preparation of the equipment shall be suitable for 24 months outdoor storage from time of shipment.

All open ends of pipes shall be treated and closed off by plastic caps and taped. Small bore threaded connections shall be taped over.

All carbon steel vessels etc. shall be protected with corrosion inhibitor prior to shipment.

Equipment and accessories must be protected from corrosion.

Vulnerable instruments shall be removed and separately packed for shipment.

Transportation bracing/ support should be used where necessary and should be clearly identified as temporary.

All crates and boxes shall contain sufficient moisture absorbing agent to avoid condensation.

PACKAGER/MANUFACTURER shall provide the procedures for unpacking, handling, installation, repacking, and long-term storage requirements.

PACKAGER/MANUFACTURER shall specify any limitations applicable to the transportation and installation phase.