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	CLIENT: SRGE					SHEET 1 of 20			
	JOB: REFERENCE BASIC DESIGN					1001056398 0010			
	AREA: BÚZIOS								
DP&T-SRGE	TITLE: NITROGEN GENERATOR SYSTEM					NP-1			
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PRELIMINARY

1 INTRODUCTION

This specification covers the minimum requirements for design, engineering, materials, fabrication, inspection, testing, commissioning and pre-commissioning of Nitrogen Generator System. The Table 1 includes the scope of supply in the package.

Table 1 - Package scope

TAG	DESCRIPTION	QUANTITY
Z-5241001	NITROGEN GENERATOR UNIT	1 x 100%
Z-5241002A/B	NITROGEN GENERATOR UNIT FOR FLARE	2 x 100%

2 NORMATIVE REFERENCES

All equipment shall comply with the requirements of this technical specification and references stated below. All equipment parts and details not complying with any of these requirements shall be informed on a "Deviation List". Otherwise they will be considered as "Agreed", and so required.

2.1 CLASSIFICATION

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

2.2 CODES AND STANDARDS

The latest editions of the following codes and standards shall be used as design guidelines:

- ASTM American Society for Testing and Materials
- ASME B16.5 Pipe Flange and Flanged Fittings
- ASME B31.3 Process Piping
- ASME/BPVC Sec VIII: Rules for Construction of Pressure Vessels
- ASME/BPVC Sec IX: Qualification Standard for Welding, Brazing, and Fuzing Procedures
- ASME/BPVC Sec V: Nondestructive Examination
- AWS D1.1 Structural Welding Code – Steel
- AISC 325 Steel Construction Manual
- API RP2A Recommended practice for planning, designing and constructing fixed offshore platforms.
- IEC 60034 Rotating Electrical Machines
- IEC 60529 Degrees of Protection Provided by Enclosures
- IEC 61892 Mobile and Fixed Offshore Units – Electrical Installations
- IEC 60092-502 Electrical Installation in Ships – Tankers – Special Features



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2.3 BRAZILIAN GOVERNMENT REGULATION

- NR 10 *Segurança em Instalações e Serviços em Eletricidade* (Safety in Electrical Facilities and Services)
- NR 13 *Caldeiras e Vasos de Pressão* (Boilers and Pressure Vessels)
- NR 26 *Sinalização de Segurança* (Safety Signaling)

Brazilian Government regulations are mandatory and shall prevail, if more stringent, over the requirements of this specification and other references herein.

2.4 REFERENCE DOCUMENTS

- | | |
|-------------------------------|--|
| DR-ENGP-M-I-1.3 | SAFETY ENGINEERING |
| DR-ENGP-I-1.15 | COLOR CODING |
| I-DE-3010.1M-1200-942-P4X-002 | GENERAL ARRANGEMENT |
| I-DE-3010.1M-5400-94A-P4X-001 | AREA CLASSIFICATION – GENERAL |
| I-FD-3010.1M-5241-470-P4X-001 | NITROGEN GENERATOR UNIT
(Z-5241001) – M-01 |
| I-FD-3010.1M-5241-470-P4X-002 | NITROGEN GENERATOR UNIT
FOR FLARE (Z-5241002A/B) – M-01 |
| I-RL-3010.1M-1200-940-P4X-001 | GENERAL SPECIFICATION FOR AVAILABLE
UTILITIES |
| I-RL-3010.1M-1200-940-P4X-003 | DRAINAGE SYSTEM GUIDELINES |
| I-ET-3010.1M-1200-200-P4X-001 | PIPING SPECIFICATION FOR TOPSIDE |
| I-ET-3010.00-1200-251-P4X-001 | BOLT MATERIALS |
| I-ET-3010.00-1200-431-P4X-001 | THERMAL INSULATION FOR MARITIME
INSTALLATIONS. |
| I-ET-3010.00-1200-956-P4X-002 | GENERAL PAINTING |
| I-ET-3010.1M-1200-300-P4X-001 | NOISE CONTROL REQUIREMENTS FOR TOPSIDE |
| I-ET-3010.00-1200-540-P4X-002 | REQUIREMENTS FOR PRESSURE VESSELS
FABRICATION |
| I-ET-3010.00-1200-540-P4X-001 | REQUIREMENTS FOR PRESSURE VESSELS
DESIGN |
| I-ET-3010.00-1200-800-P4X-002 | AUTOMATION, CONTROL AND
INSTRUMENTATION ON PACKAGED UNITS |
| I-ET-3010.1M-1200-800-P4X-014 | AUTOMATION INTERFACE ON PACKAGED 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-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-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-3000.00-1200-940-P4X-001 | TAGGING PROCEDURE FOR PRODUCTION UNITS
DESIGN |



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I-DE-3010.00-5140-700-P4X-001 LIGHTING INSTALLATIONS TYPICAL DETAILS
I-DE-3010.00-5140-700-P4X-003 GROUNDING INSTALLATIONS TYPICAL DETAILS
I-ET-3A36.00-1000-941-PPC-001_D METOCEAN DATA
I-RL-3010.1M-1350-960-P4X-009 MOTION ANALYSIS

2.5 CONFLICTING REQUIREMENTS

As a general guideline, in case of conflicting requirements between this technical specification and other cited references, the most stringent shall prevail. If necessary the VENDOR may revert to PETROBRAS for clarification.

3 DEFINITIONS AND ABBREVIATIONS

3.1 DEFINITIONS

Can: "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: An absolute requirement which shall be strictly followed in order to conform with the standard.

Should: A recommendation. Alternative solutions having the same functionality and quality are acceptable.

Critical Service: Service where failure of the machine to operate correctly results in an unsafe condition that puts the lives of personnel at risk or jeopardizes equipment. Further, it is a service where failure of the machine to operate correctly makes plant or process unacceptable as a production unit. High criticality requires equipment with high quality, high reliability, stringent testing and redundancy. Alternatively, three half-capacity machines shall be specified, two running in parallel with the third unit as a spare.

Vendor: Company responsible for the project, erection, fabrication and test of the package unit.

Manufacturer: Company responsible for the mechanical design manufacture and test of the internal equipment of the packages (ex. vessels, towers, pumps, motors, panels, etc.).

Package or Package Units: Set of equipment supplied, interconnected and operative, requiring only the connection of utilities of the platform for your operation.

3.2 ABBREVIATIONS

FAT Factory Acceptance Test
ITR Inspection & Test Release
ITP Inspection & Test Plan
SS Stainless Steel
PMI Positive Materials Identification
PSV Pressure Safety Valve

4 GENERAL FUNCTIONAL REQUIREMENTS

The Nitrogen Generator System shall be provided with all necessary instruments to operate safely, adequately and without interruption in a tropical marine environment.

4.1 OPERATION ENVIRONMENT

Equipment shall be suitable for the specified environment and range of ambient conditions, including atmospheric pressure, relative humidity, rainfall, air temperature (dry bulb, see note



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below), characteristic monthly values and wind motions defined in “revision D” of I-ET-3A36.00-1000-941-PPC-001_D – METOCEAN DATA..

Note: For air temperature (dry bulb) of electrical equipment, use the most critical conditions, among those defined by Classification Society and the specific equipment documentation.

4.2 MOTION REQUIREMENTS

Refer to I-RL-3010.1M-1350-960-P4X-009 – MOTION ANALYSIS

4.3 DESIGN CONDITIONS

VENDOR shall design the packages for the full range of process conditions as specified in the data sheets I-FD-3010.1M-5241-470-P4X-001 – NITROGEN GENERATOR UNIT (Z-5241001) – M-01 and I-FD-3010.1M-5241-470-P4X-002 – NITROGEN GENERATOR UNIT FOR FLARE (Z-5241002A/B) – M-01.

4.4 EQUIPMENT LOCATION

The Nitrogen Generator Unit (Z-5241001) and the Nitrogen Generator Unit for Flare (Z-5241002A/B) will be installed on Module M-01, see I-DE-3010.1M-1200-942-P4X-002 - GENERAL ARRANGEMENT.

For area classification see I-DE-3010.1M-5400-94A-P4X-001 - AREA CLASSIFICATION – GENERAL.

4.5 DESIGN LOADS

In addition to codes described loads and loads due to equipment motions defined on I-RL-3010.1M-1350-960-P4X-009 – MOTION ANALYSIS, the following loads shall be considered where relevant:

- Equipment transportation and erection loads;
- Nozzle loads;
- Thermal loads;
- Wind loads;
- Weight loads.

4.6 DESIGN LIFETIME

VENDOR shall design and fabricate the complete packages for a minimum lifetime of 25 years.

4.7 NOISE

Noise control analysis is a mandatory item to be carried out. Refer to I-ET-3010.1M-1200-300-P4X-001 - NOISE CONTROL REQUIREMENTS FOR TOPSIDE.

5 EQUIPMENT SPECIFICATION

5.1 SCOPE OF SUPPLY

VENDOR shall be responsible for supplying complete and fully operative systems in accordance with the requirements of this specification, attachments and standards referenced therein and to meet the process duty as specified in the documents I-FD-3010.1M-5241-470-



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P4X-001 – NITROGEN GENERATOR UNIT (Z-5241001) – M-01 and I-FD-3010.1M-5241-470-P4X-002 – NITROGEN GENERATOR UNIT FOR FLARE (Z-5241002A/B) - M-01.

VENDOR scope of supply shall comprise, but not necessarily be limited to, the following:

- A complete engineering package including design, fabrication, inspection, testing, certification and preparation for shipment of the Nitrogen Generator System. The package shall include drawings showing dimensions, weights, instrumentation and any additional information.
- A Nitrogen compressor with a discharge pressure as specified in the documents I-FD-3010.1M-5241-470-P4X-001- NITROGEN GENERATOR UNIT (Z-5241001) – M-01 and I-FD-3010.1M-5241-470-P4X-002 - NITROGEN GENERATOR UNIT FOR FLARE (Z-5241002A/B) – M-01;
- Filters and Strainers;
- Electric heater (if required);
- Activated Carbon Filter (if required);
- Membrane modules (membrane materials to be advised by VENDOR).
- One (01) dedicated air compressor for each one of the units Z-5241002A/B. VENDOR to advise if buffer vessels are required.
- One (01) nitrogen booster compressor for the unit Z-5241001 only, VENDOR to advise on capacity and supply of air pressure; (see note 1).
- One (01) pressure control valve for the nitrogen unit Z-5241001 only, to enable delivery of the produced nitrogen at two different pressure levels, as described in the respective data sheet.
- One (01) pressure control valve for each one of the units Z-5241001 and Z-5241002A/B;
- All required piping, instrumentation and valves;
- Consumables and special tools for assembly, disassembly, maintenance, commissioning and start up;
- Local control panels (PN-Z-5241001 and PN-Z-5241002A/B) with starters to be operated from within the package limits;
- All controls for automatic operation and safeguarding of the unit;
- Oxygen content analyzer for indication and alarm;
- Electrical and instrumentation installation inside skid boundary;
- All cables inside skid boundary;
- Nitrogen Storage Vessel (V-Z-5241001), as specified in the documents I-FD-3010.1M-5241-470-P4X-001- NITROGEN GENERATOR UNIT (Z-5241001) – M-01 and I-FD-3010.1M-5241-470-P4X-002 - NITROGEN GENERATOR UNIT FOR FLARE (Z-5241002A/B) – M-01;
- Pressure vessels shall be designed as per ASME VIII and shall be comply with NR-13;
- Pressure safety relief valves or bursting discs as required;

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- Hose connection for pressurized Nitrogen bottle hook-up, to be located downstream from the Nitrogen Storage Vessel in case the nitrogen system is out of action;
- One Nitrogen intensifier unit for bottle filling purposes as specified in the documents I-FD-3010.1M-5241-470-P4X-001- NITROGEN GENERATOR UNIT (Z-5241001) – M-01 and I-FD-3010.1M-5241-470-P4X-002 - NITROGEN GENERATOR UNIT FOR FLARE (Z-5241002A/B) – M-01;.
- Nitrogen bottles;
- Spectacle blinds for maintenance and testing;
- Vent including silencer;
- Complete skid with lifting lugs, earthing lugs, mounting provisions as per section 5.2.6 and 5.2.7, and all ladders and platforms for operation and maintenance, where necessary.
- Painting, proper for offshore installations and in compliance with I-ET-3010.00-1200-956-P4X-002 – GENERAL PAINTING;
- Inspection and testing;
- Certification by Classification Society where applicable;
- NR-13 compliance;
- Consumables, special tools and spare parts according to item 8;
- Preparation for shipment and preservation;
- Safety signaling in Portuguese;
- Installation, operation and maintenance manuals in Portuguese;
- Data books;
- Structural calculation;
- Total Process and mechanical guarantee;

Note 1: Compressed air for the nitrogen generator unit Z-5241001 will be supplied by the FPSO's service and instrument air system, therefore this unit will require no air compressor.

VENDOR is responsible for the following scope of supply:

- All interconnecting piping, electrical and instrumentation between VENDOR package and other FPSO equipment;
- Thermal insulation for the items above, if applicable;
- All cabling and junction boxes outside the package;
- All lighting installations;
- Supplies of all utilities and chemicals.
- Deluge spray nozzles, if applicable;
- Hoses;
- Fire and gas detectors, if applicable;



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- Installation, hook up and commissioning of the package equipment at site with VENDOR supervision;

VENDOR shall be responsible for all co-ordination and collection of all details, drawings and data to achieve optimum design and full submission of all documents requested.

VENDOR shall inform PETROBRAS the following items with his bid:

- Dimensions + weights of parts to be removed for maintenance (approximate values of similar packages/equipment from previous projects may be submitted prior to P.O. placement only).
- Documents (see section 5.1).
- Membrane guaranteed duration life.
- Materials proposed for each major component.

5.2 DESIGN REQUIREMENTS

5.2.1 GENERAL

The membrane horizontal housings shall be designed according to ASME VIII, Div. 1. In case of off-spec production, nitrogen will be vented to atmosphere by blow-down.

All elements of the packages, including sub orders, shall be of proven design and well within the manufacturer's actual experience.

For PETROBRAS, "field proven" equipment is defined as having a Reference List with at least 3 (three) operating packages (of similar capacity) installed in offshore production units. Deviations from "field proven design" may be accepted only for equipment which is part of research or development programs. In this case, their use shall be formally approved by PETROBRAS program coordinator.

5.2.2 MECHANICAL AND PIPING

The Nitrogen Generator System, including all ancillary equipment, shall be assembled to the maximum extent possible, aligned and pre-checked in VENDOR shop, allowing shipment to the installation site with minimal fieldwork.

All pressure containing enclosures shall be designed and manufactured in compliance with ASME section VIII and NR 13.

Equipment and piping within the VENDOR scope of supply, subjected to temperatures of 60°C and above, shall be thermally insulated, as well as equipment and piping where heat conservation is necessary. In both cases, the requirements of the standards mentioned above shall be complied with I-ET-3010.00-1200-431-P4X-001 – THERMAL INSULATION FOR MARITIME INSTALLATIONS.

All interconnecting piping shall comply with the requirements of ASME B31.3.

All skid piping within the limits of supply shall be fabricated and terminated at the base plate edge by means of valves and/or flanges and blind flanges according to ASME B16.5.

All major equipment shall be provided with lifting lugs.

The packages shall be designed for easy access and maintenance of the equipment.

All piping shall be routed and terminated with flanges at the skid edge.



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Socket welding is only permitted on low-pressure (non-process) piping sizes equal to or less than 1½ “. All piping above 1 ½ “ shall be butt-welded.

Two diagonally opposed earthing bosses shall be provided on each equipment item, which shall then be connected to the main skid, which also shall have two diagonally opposed earthing bosses.

After completion of fabrication, all fabricated pipe spools shall be internally and externally cleaned to remove all loose scale, weld spatter, sand, and other foreign materials.

VENDOR shall check and approve all piping with respect to stresses, vibration and layout. Anchor points shall be provided at skid edge.

For bolt materials apply the requirements of I-ET-3010.00-1200-251-P4X-001 - BOLT MATERIALS.

5.2.3 PRESSURE VESSELS DESIGN AND FABRICATION (MINIMUM REQUIREMENTS)

The proposed design shall comply with I-ET-3010.00-1200-540-P4X-002 - REQUIREMENTS FOR PRESSURE VESSELS FABRICATION and I-ET-3010.00-1200-540-P4X-001 - REQUIREMENTS FOR PRESSURE VESSELS DESIGN.

5.2.4 INSTRUMENTATION

The Nitrogen Generator System shall be protected with all necessary instruments to operate safely, adequately and without interruption in a tropical marine environment.

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.

Nitrogen Generator System is “P1 Type” packages, for further details see I-ET-3010.00-1200-800-P4X-002 - AUTOMATION, CONTROL AND INSTRUMENTATION ON PACKAGED UNITS.

All skid mounted local instruments shall be provided with process isolation valves, vent and drain valves as applicable.

The panels PN-Z-5241001 and PN-Z-5241002A/B shall be installed in the package skid.

5.2.5 ELECTRICAL

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. All certificates according to INMETRO resolutions for hazardous areas for these equipments shall be provided by VENDOR before FAT for PETROBRAS approval.



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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.

Lighting installations inside the package shall comply with requirements of I-ET-3010.00-5140-700-P4X-001 - SPECIFICATION FOR ELECTRICAL DESIGN FOR OFFSHORE UNITS and I-DE-3010.00-5140-700-P4X-001 - LIGHTING INSTALLATIONS TYPICAL DETAILS.

Grounding installations inside the package shall comply with requirements of I-ET-3010.00-5140-700-P4X-001 - SPECIFICATION FOR ELECTRICAL DESIGN FOR OFFSHORE UNITS and I-DE-3010.00-5140-700-P4X-003 - GROUNDING INSTALLATIONS TYPICAL DETAILS.

5.2.6 SKID DETAILS

The skid shall be designed to accommodate the entire package unit within the skid boundary except for the overhanging maintenance lifting beams.

The skid shall be designed to accommodate the entire package unit 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 as stated in the document I-RL-3010.1M-1350-960-P4X-009 – MOTION ANALYSIS.

The equipment and piping shall be arranged on the skid so that the center of gravity of the complete unit coincides approximately with the geometrical center of the skid.

Equipment shall be arranged on the skid so as to allow safe and good personnel access for all operations and maintenance.

Hexagon bolts, nuts and washers for use in structural constructions shall comply with I-ET-3010.00-1200-251-P4X-001 – BOLT MATERIALS.

The stresses in the skid beams, including those generated by the lifting slings during loading and unloading shall not exceed the allowable limits. These limits are defined in API RP2A and AISC ASD Steel Construction Manual. For the structural analysis of the skid the governing acceleration cases, as defined in I-RL-3010.1M-1350-960-P4X-009 – MOTION ANALYSIS, shall be checked.

When lifting the skids, complete with all equipment mounted, beam deflection shall not exceed 1/400 L.

The skid shall be designed:

- To withstand the maximum dry weight of the equipment including self-weight of the skid, packaging and temporary supports during lifting.
- To easily carry any reasonable live loads on walkways or stairs.
- To resist all sling forces, including both horizontal and vertical components of the applied sling angle (sling angles shall be within between 50° and 90° with the horizontal plane).
- With lifting facilities to permit the entire package to be lifted by crane as a single point lift for transportation and installation.
- So that it is self-draining and after installation, fluid shall not collect between the skid beams unless designed to be a drip tray.
- Drip trays shall include drain connections in different locations.
- With skid main beams braced, as required, to ensure rigidity and be designed to withstand the anticipated (torsional) vibration produced by the operating equipment and the stresses created by the ship motions.

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- With the floor made of plate material with a raised non-slip tread, where applicable.
- With welds underneath skid beams ground flush.
- With 2 diagonally opposed earthing bosses.
- Equipment mounted on skid shall not be considered as bracing in the structure.
- Skid main frame shall be full welded construction.
- Floor grating and plating shall not be used as a mounting surface for supports or equipment or piping.

5.2.7 MAINTENANCE LIFTING BEAMS

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

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

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 witnessed load testing by the PURCHASER'S representative and classification society.

5.2.8 PAD-EYES/LIFTING TRUNNIONS

Padeyes/lifting trunnions for lifting sling arrangements shall be attached for loading and unloading. If through-thickness forces occur in the pad-eye attachment, steel material with guaranteed through-thickness properties shall be provided. All welds in the spreader beams and all lifting points to the skid shall be full penetration welds with 100% radiographic or ultrasonic testing.

5.2.9 PAINTING

5.2.9.1 EXTERNAL

Paint system for external coating shall be according to I-ET-3010.00-1200-956-P4X-002 – GENERAL PAINTING.

VENDOR shall provide information, during the BID process, about the painting system regarding:

- Material Safety Data Sheet;
- Information data required by item 5.4 of ISO 20340: PAINTS AND VARNISHES – Performance Requirements for Protective Paint Systems for Offshore and Related Structures;

5.2.9.2 INTERNAL

Paint systems shall be according to VENDOR requirements, when not specified by PETROBRAS.

5.2.9.3 COLOR

Color code adopted shall be in accordance with DR-ENGP-I-1.15 – Color Code.



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SDVs shall be installed in places where they may not be affected by fire originating in other areas.

Note: CONTRACTOR is responsible for the definition of the routes of instrumentation cables for emergency consumers. These cables shall have two different routings. The definition of the routes shall consider that a fire risk scenario shall not reach them simultaneously. The routing of such cable shall be as far as possible from fire risky areas. As an alternative to the use of two different routes a fire resistant cable can be used.

5.3 VENDOR RESPONSIBILITY

VENDOR shall assume sole contractual and total engineering responsibility for the complete package.

6 NAMEPLATES

VENDOR shall attach corrosion resistant SS 316 nameplates on each item of equipment in an accessible location, fastened with corrosion resistant pins.

The nameplate information shall include, as a minimum, the following items, in Portuguese:

- Petróleo Brasileiro S.A. – PETROBRAS;
- Purchase order number;
- Manufacturer and year of built;
- Tag number;
- Service;
- Serial number;
- Main data for design, operation and testing (Power, Pressure, Volume, Temperature, Rotation, Flow rate), where applicable;
- Specific requirements;
- Installation identification;
- Driver power rating and speed, where applicable;
- Design code;
- Empty, Operation and Test Weights.

7 TAG NUMBERING

Tagging of all instrumentation, electrical, mechanical, and piping items, including valves, shall be carried out. Tag numbers shall comply with I-ET-3000.00-1200-940-P4X-001 - TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN.

The main items shall have individual tag numbers as dictated by PETROBRAS. The actual tag numbers will be advised to the VENDOR after award.



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Tags shall be supplied with the number and description in English, unless otherwise stated in the project data sheets. Valves and instruments shall be tagged with the applicable number only. Tag numbers for remaining ancillary equipment shall be given after Purchase Order placement.

All safety signs and notices shall be in Portuguese.

8 SPARE PARTS AND SPECIAL TOOLS

8.1 SPARE PARTS

VENDOR shall include in the supply of equipment all spares required for commissioning, pre-operation and start-up.

The spare parts recommended by Classification Society and those ones required for NR 13 tests shall be also supplied.

A spare parts list recommended for operation, including price and delivery time of each part, lay out and sectional drawings indicating the location of the part and TAG/ reference identification (for PETROBRAS approval) shall be provided.

All spares shall be packed separately with clear identification and delivered with the main equipment in packing suitable for long term storage.

8.2 SPECIAL TOOLS AND EQUIPMENT

All special tools necessary for the installation, operation or maintenance of the equipment shall be supplied together with the delivered equipment. These shall be separately quoted together with the package quotation.

9 CERTIFICATION REQUIREMENTS

9.1 CLASSIFICATION SOCIETY CERTIFICATION

VENDOR shall be responsible for obtaining all necessary certification of the equipment.

For each package, a Classification Society certificate suitable for the vessel to be classified shall be supplied.

9.2 GENERAL CERTIFICATION

VENDOR shall supply, through the independent certifying authority, all certificates related to the materials, inspections, tests and qualification activities detailed in the approved Quality Plan.

10 MATERIALS

10.1 GENERAL

VENDOR must select and specify the most suitable materials according to ASTM standard.

The repair and defects in pressure-containing castings by peening or burning-in or by impregnation with other compounds is not allowed.



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Repair by welding or by plugging shall be undertaken only when permitted by the material specification and shall only be applied with the procedures specified.

After weld repair, castings shall be heat treated, if specified in the material specification. A major weld repair shall always be followed by a suitable heat treatment.

Details of all major weld repairs and the heat treatment shall be recorded and reported to PETROBRAS.

The use of asbestos or materials containing asbestos is prohibited.

10.2 MATERIAL CERTIFICATION

In order to ensure that the construction materials are in accordance with the data sheets, the requirements for the certification of the material test data are stated below and shall be adhered to.

All certificates shall contain the following information:

- Name of manufacturer;
- Purchase order number and date of issue;
- Identification number of certificate and its issue;
- Material specification(s);
- Material charge number, batch number or heat number;
- Mechanical properties recorded from test results;
- NDT method and results;
- Heat treatment procedure, if applicable.

11 INSPECTION, TESTING AND COMMISSIONING

11.1 GENERAL

VENDOR is required to propose, within 2 weeks after Purchase Order, the Inspection and Test Plan (ITP) for all materials and equipment, for approval by PETROBRAS, prior to commencement of work in accordance with document schedule.

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

Unless otherwise stated, all inspections and tests shall be performed at the VENDOR workshop in the presence of PETROBRAS Representative, CLIENT and Classification Society surveyor as applicable.

Inspections and tests are an integral part of the PURCHASE ORDER which will not be considered complete until such inspections and tests have been carried out in full.

PETROBRAS shall issue an Inspection Release Certificate (I.R.C) after completion of these inspections and tests only.

11.2 MECHANICAL COMPLETION

Term used to indicate satisfactory completion of fabrication scope of work, including basic inspection and checks carried-out to demonstrate that the equipment has been fabricated



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correctly and according to PETROBRAS requirements. VENDOR shall provide relevant documentation to prove that these inspections and checks have been completed satisfactorily.

11.3 INSPECTIONS

VENDOR shall provide document schedules with the appropriate completion dates at the time drawings will be submitted for approval as indicated in the agreed document schedule.

PETROBRAS reserves the right to inspect the package at any time during fabrication to ensure that the material and workmanship are in accordance with this specification.

VENDOR shall be responsible for compliance certificates, carrying out all work examinations and tests, and be financially responsible for final inspection and testing necessary to ensure such compliance within the requirements of the Classification Society.

In addition to PETROBRAS inspection; equipment such as valves and fittings etc., intended for the package, shall be subject to all classification authority and may range from a review of VENDOR quality manual to a physical survey of VENDOR and/ or SUB-MANUFACTURER shop or final products.

The inspector shall have the right to request inspections or examinations to ensure that the equipment complies with the relevant classification society requirements. In case examination reveals shortcomings VENDOR shall bear the full cost of such inspection and replacement where necessary. Any repair shall first be approved by PETROBRAS. The subsequent examination necessary to ensure the satisfactory manufacture of the equipment in question will be at VENDOR cost.

Except if approved by PETROBRAS inspector, all equipment shall be presented for inspection in an unpainted state. VENDOR shall provide at least two weeks notice to the inspector to witness the specified tests.

11.4 HYDROSTATIC TESTING

Hydrostatic testing shall be carried out in the presence of PETROBRAS inspectors and shall include:

- All fabricated retaining pipe work to ANSI B31.3;
- All vessels to ASME VIII, Div 1 requirements.

During the test the temperature of the material and water shall not be lower than the code recommendations. VENDOR is responsible to check the water quality. For equipment made of austenitic SS the maximum chlorides content is 50 ppm. If the chlorides content is greater than 50 ppm, before the hydrostatic test it shall be internally applied, polyester-base fast drying varnish, in sufficient quantity to form a continuous film under touch.

It is forbidden to execute hydrostatic testing with water at a temperature below 15°C.

Hydrostatic testing shall be carried out after completion of machining and examinations. All piping systems shall be drained of water and dried after hydrostatic testing.

11.5 IMPACT TESTING

VENDOR shall verify, taking into account the minimum design temperature, the necessity of carrying out a Charpy impact test as per codes. Impact test shall be as per material



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specifications and codes. Guaranteed values are not acceptable, impact testing shall show the actual results.

11.6 MATERIAL, WELDING & NDT EXAMINATION

Generally, all welding and NDT shall meet the requirements of standards and codes specified in applicable sections of listed specifications.

Final non-destructive examinations, for acceptance purposes shall be carried out after completion of any post weld heat treatment (when applicable) and before the applications of painting, hydrostatic testing etc.

Magnetic particle inspection on nozzles and reinforcement pads on vessels as per code and main load bearing skid fabrication welds, including lifting pad eyes, shall be performed.

The following NDT examinations are required as a minimum:

Vessels:

- 100% RT on all main seam welds plus the pipe/ flange connections on nozzles;
- 100% UT on nozzle to shell connections;
- 100% MPI or Dye Pen (stainless steel) on a 100% dye pen on all weld overlays.

Structural steel:

- 100% RT or UT on all main beam welds and on lifting lugs;
- 10% on all other welds;
- 100% MPI on all primary steel welds.

11.7 INSTRUMENTATION

Testing shall be carried out in the presence of PETROBRAS inspectors and shall include at least:

- Hydrostatic test (valves);
- Running test (actuators);
- Review of calibration certificate (PSVs).

11.8 PACKAGE FUNCTION TEST

A full function test of each completed package shall be performed. The satisfactory operation of all indicators, selectors and controllers shall be demonstrated.

The correct operation of all controllers, alarm and fault protection equipment and indicators shall be demonstrated and if necessary fault simulations.

VENDOR is to submit FAT procedure with a test schedule covering all items within the scope of supply.

11.9 PACKAGE INSPECTION

Unless waived by PETROBRAS, the following inspections and checks shall be witnessed by PETROBRAS inspector:



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- Verification of materials of construction of the package units (vessels, filters, compressors, etc.) for conformity with the requirements of the specification.
- Verification of piping, fittings and valves as per specification of materials and fabrication.
- Radiographic, dye penetrant, magnetic particles, ultrasonic inspection of welds on pressure retaining parts of the equipment.
- Approval of the relief valve settings and witness of their testing after setting point calibrated.
- Review of ITR's

A visual check of the assembled package, noting:

- That the thickness of the pressure retaining parts meets or exceeds the quoted design thickness;
- Any repairs;
- Dry-film thickness quoted;
- The general appearances, materials, workmanship and standard of finish are acceptable;
- Dimensional check etc;
- Alignment to be demonstrated.

11.10 FACTORY ACCEPTANCE TEST

Where applicable, F.A.T. procedure (including performance test) shall be developed by VENDOR and submitted to PETROBRAS for approval according to the Vendor Document Schedule defined in the PURCHASE ORDER.

The FAT will be witnessed by PETROBRAS representatives. VENDOR shall advise PETROBRAS of the test schedule at least two (2) weeks for Brazilian VENDOR/ Sub-Suppliers and 3 (three) weeks for foreign VENDOR/ Sub-Suppliers before the planned test dates. VENDOR shall invite CLASS surveyor for FAT. In case PETROBRAS is invited and equipment is not ready for FAT, all costs associated with the visit are for VENDOR account.

In addition, following tests shall be included in VENDOR scope:

- Hydrotest of all vessels and pipes;
- Electrical continuity and insulation checks on all wiring and earthing continuity;
- Functional checks on all instruments and valves;
- Control panel tests.

VENDOR shall prepare a factory acceptance test / procedure (FAT) for the package and submit for PETROBRAS approval.

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

11.11 ASSEMBLY ASSISTENCE AND COMMISSIONING REQUIREMENTS

VENDOR is responsible for assembly supervision of the equipment, including the assembly of components to be delivered loose (for exemple, pumps components such as stuffing box; some vessels' internals, etc.).



VENDOR is responsible for pre-commissioning and commissioning supervision of the equipment/system. Final acceptance will be on satisfactory completion of commissioning tests as specified by PETROBRAS.

12 PREPARATION FOR SHIPMENT

12.1 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 PETROBRAS.

As a minimum, the following identification shall be provided:

- Project Number;
- Manufacturer's name;
- Purchase Order Number;
- Minimum Breaking Load (MBL);
- Item Number;
- Classification Society surveyor's stamp.

All items supplied to this specification shall be adequately marked for identification against a certificate or relevant test documentation.

12.2 SHIPMENT PACKING

VENDOR shall provide the procedures for unpacking, handling, and installation, as well as repacking, and long-term storage requirements.

VENDOR shall specify any limitations applicable to the transport and installation phase.

The equipment shall be supplied tested, flushed and preserved. The preparation shall make the equipment suitable for 12 months outdoor storage from the time of shipment. The package shall be protected from corrosion.

VENDOR shall submit the packing design to PETROBRAS for approval.

VENDOR shall package the equipment in accordance with the packaging requirements of the country to which the equipment is being shipped.



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13 WEIGHT CONTROL

VENDOR shall fill in the following attachments:

1	APPLICABLE TO [1]:	<input checked="" type="checkbox"/> PROPOSAL	<input type="checkbox"/> PURCHASE	<input type="checkbox"/> AS BUILT
2	FOR:	UNIT / MODULE: _____		
3	SITE:	SERVICE: _____		
4	No REQ / TAG:	MANUFACTURER: _____		
5	MODEL:	VENDOR: _____		
6	SIZE / TYPE:	MAIN EQUIPMENT: _____		
7	SERIAL No.	MANUFACTURER No: _____		

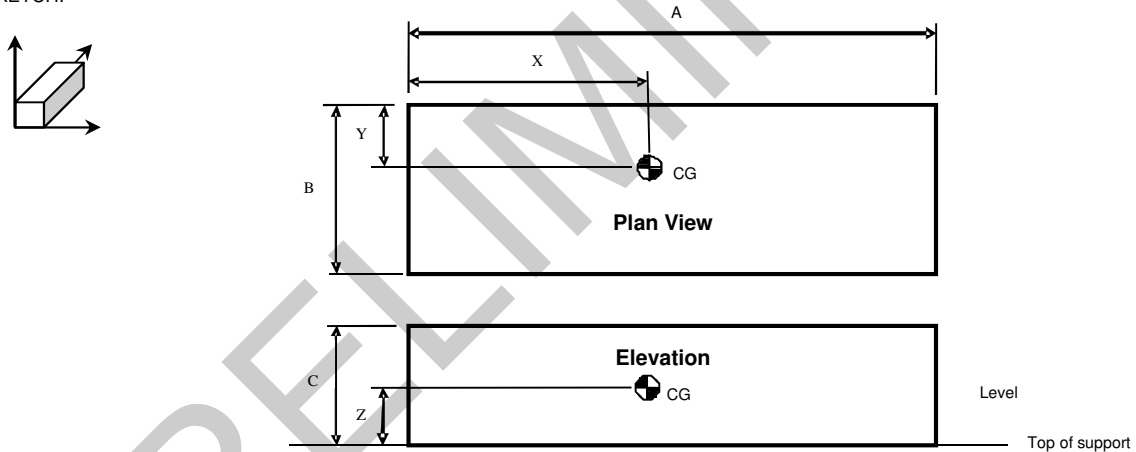
WEIGHT DATA [2]

9	DATA STATUS:	<input type="checkbox"/> ESTIMATED	<input type="checkbox"/> CALCULATED	<input type="checkbox"/> WEIGHTED
10	EQUIPMENT WEIGHT:			ACCURACY: _____
11	DRY:	_____ kg	± _____ %	REMARKS: _____ _____ _____
12	OPERATING (NORMAL):	_____ kg	± _____ %	
13	OPERATING (MAXIMUM):	_____ kg	± _____ %	
14	TEST:	_____ kg	± _____ %	
15	MAX MAINTENANCE	_____ kg	± _____ %	
16	_____	_____ kg	± _____ %	

DIMENSIONS DATA [3]

19	DATA STATUS:	<input type="checkbox"/> ESTIMATED	<input type="checkbox"/> CALCULATED	<input type="checkbox"/> MEASURED
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SKETCH:



37	OVERALL DIMENSIONS:	DRY DIMENSIONS:	OPERATING DIMENSIONS:	MAINTENANCE DIMENSIONS:
38	A: _____ mm	X: _____ mm	X: _____ mm	_____ : _____ mm
39	B: _____ mm	Y: _____ mm	Y: _____ mm	_____ : _____ mm
40	C: _____ mm	Z: _____ mm	Z: _____ mm	_____ : _____ mm

NOTES

General:

- Vendor shall fill in all blank spaces in the weight control data sheet (fields and check boxes). All missing information will be considered as not applicable or not according to vendor's proposal.
- Vendor shall fill in data sheets for main and auxiliary equipment, furnished separately or on different skids. If necessary, manufacturer shall produce additional copies of the weight control data sheet.

Weight data:

- Accuracy of weight figures shall be ± 10% in the proposal phase. After placing of the purchase order, the accuracy shall be refined to ± 3%.

Dimensional data:

- Manufacturer shall indicate equipment orientation.
- Any variation in center of gravity from dry to operating mode shall be noted.
- Manufacturer shall indicate with dashed lines on sketch and respective dimensions on the information table all maintenance areas required for assembly and disassembly of equipment.
- Accuracy of dimensions shall be ± 10% in the proposal phase. After placing of the purchase order, the accuracy shall be refined to ± 3%.