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	JOB: <b>REFERENCE HULL 01</b>		
	AREA: <b>-</b>		
<b>SRGE</b>	<b>DIESEL OIL PURIFIER (SC-5133501A/B)</b>		<b>INTERNAL</b>
			<b>ESUP</b>

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PROJECT	ESUP/ENE	ESUP/ENE							
EXECUTION	CXZ0	CXZ0							
CHECK	T3P7	PMX4							
APPROVAL	BYA6	BYA6							

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THIS FORM IS PART OF PETROBRAS N-381 REV.J ANNEX A – FIGURE A.1.




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## 1. INTRODUCTION

### 1.1. OBJECTIVE

The purpose of this technical specification is to describe the minimum requirements for the design, manufacturing, assembly, supply, installation and tests of DIESEL OIL PURIFIER (SC-5133501A/B) in conformance with relevant regulations and REFERENCE HULL 01 basic design documentation.

### 1.2. DEFINITIONS

**PACKAGE:** It is defined as an assembly of equipment supplied interconnected, tested and ready to operate, requiring only the available utilities from the Unit for the Package operation.

**PACKAGER:** It is defined as the responsible for project, assembly, construction, fabrication, testing and furnishing of the Package.

DIESEL OIL PURIFIER (SC-5133501A/B) the package name.

OWNER: PETROBRAS.

All definitions are found on I-ET-3010.00-1200-940-P4X-002 – GENERAL TECHNICAL TERMS

### 1.3. ABBREVIATIONS

CS.....Classification Society

FAT.....Factory Acceptance Tests

FPSO.....Floating Production Storage and Offloading Unit

SOS.....Supervisory and Operation System


SOS-HMI..... Human Machine Interface of SOS

## 2. NORMATIVE REFERENCES

### 2.1. INTERNATIONAL CODES, RECOMMENDED PRACTICES AND STANDARDS

The equipment will be designed and manufactured in accordance with the following codes and standards, if not mentioned otherwise.

- ASME B31.3 – Process Piping
- ASME B16.5 – Pipe Flanges & Flanged Fittings
- AWS D1.1 – Structural Welding Code
- ISO – International Standard Organization

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- IMO – International Maritime Organization
- IEC – International Electrotechnical Commission
- SOLAS II-1, Regulation 3-5, and MSC.1/Circ. 1379
- Classification Society defined for the Hull scope.

## 2.2. BRAZILIAN CODES AND STANDARDS

- NR – Brazilian Federal Government Regulatory Norms (Normas Regulamentadoras NRs).
- NORMAM-01 – Normas da Autoridade Marítima para Embarcações Empregadas na Navegação em Mar Aberto.
- INMETRO Resolution 115, Mach 21st 2022.


## 2.3. CLASS APPROVAL AND CERTIFICATION

The PACKAGE shall be designed, manufactured and tested according to the design reference documents, normative requirements and in accordance with the latest editions of Classification Society Rules, Regulations and Standards.

## 3. REFERENCE DOCUMENTS

### 3.1. REFERENCE HULL 01 FPSO BASIC DESIGN

REF DOC NUMBER	REF DOC NAME
<b>HULL SYSTEMS</b>	
I-DE-3010.2E-5115-944-P4X-002	FRESH, HOT AND POTABLE WATER SYSTEM
I-DE-3010.2E-5133-944-P4X-003	DIESEL OIL PURIFIER AND SERVICE SYSTEM
I-DE-3010.2E-5133-944-P4X-004	DIESEL OIL STORAGE SYSTEM
I-DE-3010.2E-5415-944-P4X-004	VENTING AND SOUNDING SYSTEM
I-DE-3010.2E-6124-944-P4X-001	HULL SERVICE AND INSTRUMENT AIR DISTRIBUTION SYSTEM
I-FD-3010.2E-5133-661-P4X-001	DIESEL OIL PURIFIER (SC-5133501A/B)
I-MD-3010.2E-1200-940-P4X-027	DESCRIPTIVE MEMORANDUM - HULL SYSTEMS
<b>OUTFITTING</b>	


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I-DE-3010.2E-1351-140-P4X-001	HULL GENERAL NOTES AND TYPICAL DETAILS
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Table 1 – Reference Hull 01 FPSO basic design.


### 3.2. TYPICAL DOCUMENTS

REF DOC NUMBER	REF DOC NAME
<b>GENERAL</b>	
I-ET-3000.00-0000-940-P4X-002	SYMBOLS FOR PRODUCTION UNITS DESIGN
I-ET-3010.00-1200-940-P4X-002	GENERAL TECHNICAL TERMS
I-ET-3000.00-1200-940-P4X-001	TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN
<b>CONSTRUCTION</b>	
I-ET-3010.00-1200-955-P4X-001	WELDING
I-ET-3010.00-1000-970-P4X-002	REQUIREMENTS FOR NDT
I-ET-3010.00-1200-955-P4X-002	REQUIREMENTS FOR WELDING INSPECTION
I-ET-3010.00-0000-970-P4X-001	REQUIREMENTS FOR PROCEDURES AND PERSONNEL QUALIFICATION AND CERTIFICATION
<b>MECHANICAL</b>	
I-ET-3010.00-1352-130-P4X-001	FLOOR GRATINGS, TRAY SYSTEMS AND GUARDRAILS MADE OF COMPOSITE MATERIALS.
I-ET-3010.00-1200-300-P4X-001	NOISE AND VIBRATION CONTROL REQUIREMENTS
<b>PAINTING</b>	
I-ET-3010.00-1200-956-P4X-002	GENERAL PAINTING
DR-ENGP-I-1.15	COLOR CODING
<b>SAFETY</b>	

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I-ET-3010.00-5400-947-P4X-002	SAFETY SIGNALING
DR-ENGP-M-I-1.3	SAFETY ENGINEERING GUIDELINE
<b>PIPING</b>	
I-ET-3010.00-1200-251-P4X-001	REQUIREMENTS FOR BOLTING MATERIALS
I-ET-3010.00-1200-200-P4X-115	REQUIREMENTS FOR PIPING FABRICATION AND COMMISSIONING
<b>ELECTRICAL</b>	
I-DE-3010.00-5140-700-P4X-003	GROUNDING INSTALLATION TYPICAL DETAILS
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-3010.00-5140-712-P4X-001	LOW-VOLTAGE INDUCTION MOTORS FOR OFFSHORE UNITS
<b>INSTRUMENTATION AND AUTOMATION</b>	
I-ET-3010.00-1200-800-P4X-002	AUTOMATION, CONTROL AND INSTRUMENTATION ON PACKAGE UNITS
I-ET-3010.00-1200-800-P4X-013	GENERAL CRITERIA FOR INSTRUMENTATION PROJECTS
I-ET-3010.00-5520-888-P4X-001	AUTOMATION PANELS
I-ET-3010.00-1200-800-P4X-015	REQUIREMENTS FOR TUBING AND FITTING (ALIGNED TO IOGP-JIP33 S-716)

Table 2 – Reference Hull 01 Typical Documents.

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### 3.3. SPECIFIC PROJECT DOCUMENTS

REF DOC NUMBER	REF DOC NAME
<b>GENERAL</b>	
I-DE-GENERAL ARRANGEMENT	GENERAL ARRANGEMENT
I-DE-AREA CLASSIFICATION – GENERAL	AREA CLASSIFICATION – GENERAL
I-ET-AUTOMATION INTERFACE OF PACKAGE UNITS	AUTOMATION INTERFACE OF PACKAGE UNITS
I-ET-METOCEAN DATA	METOCEAN DATA
I-RL-GENERAL SPECIFICATION FOR AVAILABLE UTILITIES	GENERAL SPECIFICATION FOR AVAILABLE UTILITIES
I-RL-MOTION ANALYSIS	MOTION ANALYSIS

Table 3 – Specific Project Documents.

- Note: these documents title and number on table 3 may vary slightly from one project to another. project's document list shall be consulted in order to verify the correct document number and title.

## 4. DESIGN REQUIREMENTS


### 4.1. DESIGN CONDITIONS

- 4.1.1. PACKAGE Equipment shall be designed for a 30-year life in a corrosive offshore environment without the need for replacement of any major component due to wear, corrosion, fatigue, or material failure.
- 4.1.2. PACKAGER shall design the equipment for the full range of operational conditions as specified in this technical specification.
- 4.1.3. PACKAGE Equipment shall be designed with the compliance of the normative and design requirements as stated in this specification and complying with the technical parameters stated on the above item 3 with the FPSO REFERENCE HULL 01 basic design reference documents.

### 4.2. SAFETY REQUIREMENTS

- 4.2.1. Personnel safety protection shall be provided according to Brazilian Regulatory Norms (NR) issued by Brazilian Government.
- 4.2.2. Warning signs in Brazilian Portuguese language shall be provided where risk of personnel injury exist.



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- 4.2.3. 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.
- 4.2.4. In accordance with the requirements of SOLAS II-1, Regulation 3-5, and MSC.1/Circ. 1379, all equipment and material to be supplied by PACKAGER must be “asbestos free”.
- 4.2.5. Safety signaling shall be in full compliance with I-ET-3010.00-5400-947-P4X-002 – SAFETY SIGNALING.
- 4.2.6. For additional safety requirements refer to DR-ENGP-M-I-1.3 – SAFETY ENGINEERING GUIDELINE.

### 4.3. NOISE AND VIBRATIONS

- 4.3.1. Noise and vibrations limits shall be in conformance with I-ET-3010.00-1200-300-P4X-001 – NOISE AND VIBRATION CONTROL REQUIREMENTS.

### 4.4. MOTIONS AND ACCELERATION


- 4.4.1. All equipment shall be able to withstand with the UNIT subjected to 100-year return period environmental conditions.
- 4.4.2. All equipment shall be able to operate with the UNIT subjected to 1-year return period environmental conditions.
- 4.4.3. All environmental conditions are defined in I-ET-METOCEAN DATA.
- 4.4.4. For the Hull loading conditions details and the maximum designed operational trim and heel inclinations refer to I-ET-3010.00-1350-960-P4X-001 – DESIGN REQUIREMENTS – NAVAL ARCHITECTURE.
- 4.4.5. For the design data and information regarding motion requirements refer to I-RL-MOTION ANALYSIS.
- 4.4.6. PACKAGE is also to withstand inertial forces during transportation from construction site to the final offshore location.

## 5. PACKAGE SCOPE OF SUPPLY

### 5.1. SCOPE OF SUPPLY:

Equipment	TAG	Qty
Diesel Oil Purifier	SC-5133501A/B	2 x 100%
Diesel Oil Centrifugal Purifier Control Panel	PN-SC-5133501A/B	2 x 100%

Table 4 – PACKAGE Scope of Supply

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5.1.1. In addition to the table 4, PACKAGE shall also be composed by the following items to be assembled on the PACKAGE Skid:

- i. Electrical motors for Diesel Oil Purifiers with all necessary interconnections.
- ii. Diesel oil feed pumps (2 X 100%).
- iii. Skid control valves.
- iv. Diesel oil heaters (if applicable).
- v. Tank for the sludge removed from the purifying process.
- vi. Sludge pump for the sludge removal.

5.1.2. All interconnection piping, valves and accessories, instruments, alarms and other devices to ensure the proper and safe operation of the PACKAGE.

## 5.2. PACKAGE LOCATION

5.2.1. PACKAGE shall be installed in a dedicated room inside the Engine Room which is a closed and non-classified compartment.

5.2.2. For PACKAGE location refer to I-DE-GENERAL ARRANGEMENT and I-DE-AREA CLASSIFICATION – GENERAL.

## 6. PACKAGE SPECIFICATION

### 6.1. DIESEL OIL PURIFIER (SC-5133501A/B)


6.1.1. PACKAGE shall have two (2 x 100%) self-cleaning, electrical driven, vertical shaft and compact diesel oil purifiers supplied with a sludge tank, a sludge pump, diesel oil feed pumps, starter/control panels and mechanical accessories mounted / coupled in a common skid.

6.1.2. PACKAGE shall be able to treat the received diesel oil from both storage tanks (TQ-5133501 P/S) and transfer it to both structural diesel oil service tanks (TQ-5133502 P/S) ready for consumers.


6.1.3. Diesel oil purifiers suction from diesel oil storage tanks (TQ-5133501 P/S) shall be performed by 2 x 100% diesel oil purifier feed pumps. Each pump shall be able to attend any of the diesel oil centrifugal purifiers.

6.1.4. PACKAGE shall have a structural sludge tank to collect the sludge generated during the purifying process. The sludge shall be further transferred to the Hull sludge tank (TQ-5330502) by means of a dedicated sludge pump.

6.1.5. PACKAGE sludge tank shall have a dedicated vent line with the diameter to be confirmed in the detailed design phase as per PACKAGER design. For details refer to I-DE-3010.2E-5415-944-P4X-004 – VENTING AND SOUNDING SYSTEM.

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<p>6.1.6. To ensure the PACKAGE safe operational conditions PACKAGER shall provide protection against pressure and flow rates deviation scenario.</p> <p>6.1.7. PACKAGE with their components such as the sludge tank, sludge pump, piping and valves / control valves shall be designed in such way to not generate any leaking from the equipment to the purifier room during the PACKAGE operational life.</p> <p>6.1.8. Diesel oil standard to be reached after the purifying process is informed on I-RL-GENERAL SPECIFICATION FOR AVAILABLE UTILITIES.</p> <p><b>6.2. UTILITIES AVAILABLE ONBOARD</b></p> <p>6.2.1. For Hull fresh water system refer to I-DE-3010.2E-5115-944-P4X-002 – FRESH, HOT AND POTABLE WATER SYSTEM.</p> <p>6.2.2. For Hull essential / service instrument air system refer to I-DE-3010.2E-6124-944-P4X-001 – HULL SERVICE AND INSTRUMENT AIR DISTRIBUTION.</p> <p><b>6.3. DIESEL OIL CENTRIFUGAL PURIFIER PANEL (PN-SC-5133501A/B)</b></p> <p>6.3.1. For the Diesel Oil Centrifugal Purifier Panels (PN-SC-5133501A/B) the specification shall follow the references shown on item 7.1 and 7.2 of this technical specification.</p> <p>6.3.2. Control valves design and supply are PACKAGER scope. Control set point and eventual interlocking for the system protection, alarm and control shall be supplied by PACKAGER.</p> <p>6.3.3. For the Diesel Oil Centrifugal Purifier Panels (PN-SC-5133501A/B) location requirements refer to I-ET-3010.00-5140-700-P4X-003 – ELECTRICAL REQUIREMENTS FOR PACKAGES FOR OFFSHORE UNITS.</p> <p><b>6.4. SKID REQUIREMENTS</b></p> <p>6.4.1. PACKAGE skid structure shall be designed to withstand the design conditions mentioned on item 4.4 and to ensure the lifting conditions on manufacturing site and shipyard. Lifting lugs shall be provided according to PACKAGER lifting procedure.</p> <p>6.4.2. The Skid main frame shall be all welded construction. Structural skid welds, including lifting facilities shall be continuous and shall comply with AWS D1.1 (structural welding code) and CS Rules. Skid structure shall be designed to be welded to the supporting structure unless otherwise specified.</p> <p>6.4.3. PACKAGE skid layout and arrangement shall be designed to provide sufficient access to pumps, instruments, equipment, and control panels to ease the operability and maintenance with safe conditions. Instruments and valves shall be installed on a suitable height to allow safe access for monitoring, operation, and maintenance.</p>			

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<p>6.4.4. All necessary maintenance davits, monorails, padeyes or trolleys shall be provided to ensure the safe and easy maintenance conditions.</p> <p>6.4.5. Access ladders, platforms, gratings and any other access device shall comply with I-ET-3010.00-1352-130-P4X-001 - FLOOR GRATINGS, TRAY SYSTEMS AND GUARDRAILS MADE OF COMPOSITE MATERIALS. Metallic material is also acceptable and I-DE-3010.2E-1351-140-P4X-001 – HULL GENERAL NOTES AND TYPICAL DETAILS, item 3.23, shall be followed for metallic grating requirements.</p> <p>6.4.6. Drip trays with drain connections shall be provided underneath the PACKAGE Skid. Draining from those trays shall be directed to the Bilge Water Settling Tank (TQ-5330501).</p> <p>6.4.7. PACKAGE Equipment and components (except electrical panels) shall be located entirely within the skids / equipment base perimeter, including all equipment, tanks, piping, valves, instrumentation and controls.</p>			
<p><b>7. GENERAL REQUIREMENTS</b></p> <p><b>7.1. ELECTRICAL REQUIREMENTS</b></p> <p>7.1.1. PACKAGE electrical equipment, material, low voltage induction motors, and grounding installation shall comply with the following references:</p> <ul style="list-style-type: none"> <li>a) I-ET-3010.00-5140-700-P4X-002 – SPECIFICATION FOR ELECTRICAL MATERIAL AND EQUIPMENT FOR OFFSHORE UNITS.</li> <li>b) I-ET-3010.00-5140-712-P4X-001 – LOW-VOLTAGE INDUCTION MOTORS FOR OFFSHORE UNITS.</li> <li>c) I-ET-3010.00-5140-700-P4X-003 – ELECTRICAL REQUIREMENTS FOR PACKAGES FOR OFFSHORE UNITS.</li> <li>d) I-ET-3010.00-5140-700-P4X-001 – SPECIFICATION FOR ELECTRICAL DESIGN FOR OFFSHORE UNITS.</li> <li>e) I-DE-3010.00-5140-700-P4X-003 – GROUNDING INSTALLATION TYPICAL DETAILS.</li> </ul> <p><b>7.2. INSTRUMENTATION AND AUTOMATION REQUIREMENTS</b></p> <p>7.2.1. PACKAGE criteria for instrumentation, automation, interface and control design shall follow the below technical specifications:</p> <ul style="list-style-type: none"> <li>a) I-ET-3010.00-1200-800-P4X-002 – AUTOMATION, CONTROL AND INSTRUMENTATION ON PACKAGE UNITS.</li> <li>b) I-ET-3010.00-1200-800-P4X-013 – GENERAL CRITERIA FOR INSTRUMENTATION PROJECTS.</li> </ul>			

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c) I-ET- AUTOMATION INTERFACE OF PACKAGE UNITS.

d) I-ET-3010.00-5520-888-P4X-001 – AUTOMATION PANELS.

### 7.3. PAINTING REQUIREMENTS

7.3.1. PACKAGE painting and coating shall be performed in accordance with I-ET-3010.00-1200-956-P4X-002 – GENERAL PAINTING and DR-ENGP-I-1.15 COLOR CODING.

7.3.2. All components shall be delivered fully painted/coated, unless otherwise indicated on this specification.

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

### 7.4. NAMEPLATES AND TAG NUMBERING

7.4.1. PACKAGER / MANUFACTURER Equipment 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.

- Note 1: additional nameplates shall be provided as per NR13 rules if applicable.
- Note 2: for further requirements refer to EXHIBIT V – DIRECTIVES FOR PROCUREMENT.

7.4.2. Tagging of all instruments, electrical, mechanical and piping items, including valves, shall be carried out as detailed on I-ET-3000.00-1200-940-P4X-001 – TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN.


## 8. PACKAGE MANUFACTURING AND DELIVERY REQUIREMENTS

### 8.1. GENERAL

8.1.1. All materials and equipment supplied by PACKAGER / MANUFACTURER shall be brand new (not overhauled), field proven, free from defects and accepted by Owner and the Classification Society.

8.1.2. Materials and equipment shall be manufactured according to internationally recognized standards for the offshore oil drilling and production industries and shall be in conformance with the REFERENCE HULL 01 basic design related specifications and requirements.

8.1.3. Field proven definition as EXHIBIT V – DIRECTIVES FOR PROCUREMENT: systems and equipment shall demonstrate satisfactory operation at least in 3 floating offshore installation units, operating under process conditions (pressure, flow, capacity and similar fluids) for a minimum of 24,000 hours. For rotating equipment, they must demonstrate operation with fluid, flow and

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discharge pressure similar to the design. Unproven designs or prototypes (including components) without offshore service will not be accepted.

## 8.2. WELDING

8.2.1. PACKAGE equipment, structures and piping welding, welding inspection, non-destructive testing (NDT), bolted joints assembly and piping fabrication and commissioning activities shall be performed in compliance with the following technical specifications:

- a) I-ET-3010.00-1000-970-P4X-002 – Requirements for NDT.
- b) I-ET-3010.00-1000-955-P4X-002 – Requirements for Welding Inspection.
- c) I-ET-3010.00-1000-955-P4X-001 – Welding.
- d) I-ET-3010.00-1200-200-P4X-001 – Requirements for Bolted Joints Assembly and Management.
- e) I-ET-3010.00-1200-200-P4X-115 – Requirements for Piping Fabrication and Commissioning.

## 8.3. DOCUMENTATION

8.3.1. For the PACKAGE documentation and data-book requirements refer to EXHIBIT III – DIRECTIVES FOR ENGINEERING and to EXHIBIT V – DIRECTIVES FOR PROCUREMENT.

## 8.4. SPARE PARTS

8.4.1. For the PACKAGE, spare parts, special tools, CS required spare parts and spare parts list recommended for two (2) years of operation refer to EXHIBIT V – DIRECTIVES FOR PROCUREMENT.

## 8.5. INSPECTION AND TESTS

8.5.1. For PACKAGE inspection, tests, factory acceptance test (FAT) and inspection release certificate (IRC), refer to EXHIBIT V – DIRECTIVES FOR PROCUREMENT.

8.5.2. For PACKAGE inspection and test plan (ITP) requirements refer to EXHIBIT VII – DIRECTIVES FOR QUALITY ASSURANCE SYSTEM.

## 8.6. PRESERVATION, PACKING AND TRANSPORTATION

8.6.1. For PACKAGE preservation, packing and transportation requirements refer to EXHIBIT V – DIRECTIVES FOR PROCUREMENT.