PETROBRAS	TECHNICAL SPECIFICATION	N°: I-ET-3010.2Q-1200-800-P4X-001	
	CLIENT: MARLIM LESTE E SUL		SHEET: 1 of 11
	JOB: BASIC DESIGN – REVIT I		
	AREA: MARLIM LESTE E SUL		
	TITLE: **INSTRUMENTATION ADDITIONAL TECHNICAL REQUIREMENTS**		ESUP
			INTERNAL

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INDEX OF REVISION

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0	ORIGINAL
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EXECUTION	C27N	U44D				
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SUMMARY

1 INTRODUCTION

1.1 Object

1.1.1 This document establishes the Instrumentation and Automation Additional Technical Requirements for the UNIT.

1.1.2 These requirements are general information related to all systems or refer to subjects that are not defined other documents and some are remarks that shall be considered at detailed design phase.

1.2 Definitions

1.2.1 Refer to I-ET-3010.00-1200-940-P4X-002 - GENERAL TECHNICAL TERMS.

1.3 Abbreviations

1.3.1 The following abbreviations are used in this document:

AEPR	Automation & Electrical Panels Room
CCR	Central Control Room
CSS	Control Safety System
ESD	Emergency Shutdown
IP	Ingress Protection Ratings
LTE	Long Term Evolution
SHF	Super High Frequency
SOS	Supervision and operation System
UHF	Ultra High Frequency
VHF	Very High Frequency

2 REFERENCE DOCUMENTS, CODES AND STANDARDS

2.1 External References

2.1.1 International Codes, Recommended Practices and Standards

ASTM - AMERICAN SOCIETY FOR TESTING AND MATERIALS

ASTM	G21	STANDARD PRACTICE FOR DETERMINING RESISTANCE OF SYNTHETIC POLYMERIC MATERIALS TO FUNGI

IEC - INTERNATIONAL ELECTRO TECHNICAL COMMISSION

IEC	60068	ENVIRONMENTAL TESTING – ALL PARTS
IEC	60079	EXPLOSIVE ATMOSPHERES – ALL PARTS
IEC	60092-504	ELECTRICAL INSTALLATIONS IN SHIPS - PART 504: AUTOMATION, CONTROL AND INSTRUMENTATION
IEC	60529	DEGREES OF PROTECTION PROVIDED BY ENCLOSURES (IP CODE)
IEC	60533	ELECTRICAL AND ELECTRONIC INSTALLATIONS IN SHIPS - ELECTROMAGNETIC COMPATIBILITY (EMC) – SHIPS WITH A METALLIC HULL
IEC	61000	ELECTROMAGNETIC COMPATIBILITY (EMC) – ALL PARTS
IEC	61086	COATINGS FOR LOADED PRINTED WIRE BOARDS (CONFORMAL COATINGS) – ALL PARTS
IEC	61892	MOBILE AND FIXED OFFSHORE UNITS -ELECTRICAL INSTALLATIONS – ALL PARTS

IEC	CISPR-16	SPECIFICATION FOR RADIO DISTURBANCE AND IMMUNITY MEASURING APPARATUS AND METHODS – ALL PARTS

INMETRO – INSTITUTO NACIONAL DE METROLOGIA, NORMALIZAÇÃO E QUALIDADE INDUSTRIAL

PORTARIA Nº 115 (21/MARÇO/2022)	REQUISITOS DE AVALIAÇÃO DA CONFORMIDADE PARA EQUIPAMENTOS ELÉTRICOS PARA ATMOSFERAS EXPLOSIVAS - CONSOLIDADO.

2.1.2 Classification Society

2.1.3 The detailed design shall be submitted for approval by Classification Society. The design and installation shall follow their requirements and comments.

2.2 Internal Documents

2.2.1 Project Specification

I-ET-3010.00-1200-800-P4X-013	GENERAL CRITERIA FOR INSTRUMENTATION PROJECTS
I-ET-3010.00-1352-130-P4X-001	FLOOR GRATINGS, TRAY SYSTEMS AND GUARDRAILS MADE OF COMPOSITE MATERIALS
I-ET-3000.00-1200-940-P4X-001	TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN
I-ET-3010.00-5140-700-P4X-001	SPECIFICATION FOR ELECTRICAL DESIGN FOR OFFSHORE UNITS
I-ET-3010.00-5140-700-P4X-009	GENERAL REQUIREMENTS 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-3010.00-5520-861-P4X-001	CONTROL AND SAFETY SYSTEM – CSS
I-ET-3010.00-5520-861-P4X-002	SUPERVISION AND OPERATION SYSTEM – SOS
I-ET-3010.00-5520-888-P4X-001	AUTOMATION PANELS
I-ET-3010.00-5515-762-PPT-002	GMDSS AND OPERATIONAL RADIO SYSTEMS
I-ET-3010.00-5512-762-PPT-002	LTE TRANSMISSION SYSTEM
I-ET-3010.2Q-1200-800-P4X-005	FIELD INSTRUMENTATION
I-RL-3010.2Q-1200-940-P4X-001	GENERAL SPECIFICATION FOR AVAILABLE UTILITIES
I-RL-3010.2Q-1350-960-P4X-002	MOTION ANALYSIS
DR-ENGP-M-I-1.3	SAFETY ENGINEERING

3 ENVIRONMENTAL AND OPERATING CONDITIONS

3.1 General

3.1.1 All equipment and instrumentation devices shall be suitable to withstand the dynamics loads imposed by wave motions during tow and on final location. For a detailed evaluation of maximum expected motions and accelerations during transit and operational conditions, see I-RL-3010.2Q-1350-960-P4X-002 – MOTION ANALYSIS.

3.1.2 All equipment and their components, instruments shall be suitable for service and storage under tropical conditions of high temperature, high humidity, and heavy rainfalls and resistant against mold and fungus.

3.1.3 All electrical and electronic devices, beyond mechanical parts of the equipment, shall be designed and constructed in a tropicalized version. Tropicalization process comprises application of reinforced protective resin Class 2 according to IEC 61086 and fungus proof according to ASTM G21 in all printed circuit boards, use of anti-rust materials and accessories and other implementations according to manufacturers' experiences and related rules, aiming to provide a robust and reliable construction.

3.1.4 All electrical/electronic instruments and equipment located in hazardous areas shall be certified according to IEC 60079 and IEC 61892-7 standards.

3.1.5 All automation and instrumentation equipment that operate with electrical power installed in external (open) areas, that shall be kept operating during emergency shutdown ESD-3P or ESD-3T shall be certified for, at least, installation in hazardous areas Zone 2 (EPL Gc) Group IIA temperature T3, unless they are automatically de-energized in case of confirmed gas in equipment area, according to IEC 61892-1.

3.1.6 All instruments, junction box, panels, materials and equipment proper to be used in hazardous areas, shall have conformity certificates complying with PORTARIA INMETRO Nº 115, published in 21/Mar/2022 (or the one that succeeds it) and shall be approved by Classification Society. The certificate file names shall be in accordance with the requirements defined in I-ET-3010.00-5140-700-P4X-001 - SPECIFICATION FOR ELECTRICAL DESIGN FOR OFFSHORE UNITS.

3.1.7 All materials used shall be non-hygroscopic, flame retardant and resistant to corrosion caused by marine environmental and hydrocarbon continuous contact and they shall be in accordance with the Classification Society requirements.

3.1.8 All equipment, panels and instrumentation devices shall be suitable to be installed at the following minimum environmental and operating conditions described in item 3.2.

3.1.9 All equipment, panels and instrumentation devices shall be suitable to withstand, without damages, the minimum and maximum mean temperatures of construction, integration and commissioning sites.

3.2 Installation Environment

3.2.1 Indoors Equipment

3.2.1.1 Air-conditioned area

- Operational Temperature: 24 ºC (± 1%, normal situations)/ 40 ºC (emergency situations);
- Maximum Temperature: 45 ºC (room)/ 70 ºC (panel) (See note);
- Relative Air Humidity: 50% (± 5%);
- Salinity: 1 mg of NaCl/m^3 of air.

NOTE: In emergency situations, the room temperature will operate normally at 35 ºC and may reach up to 45 ºC. Inside Panels and other equipment, however, air temperature may reach 70 ºC. Therefore, all equipment, including Panels, and their internal components shall be designed to withstand room temperature of 45 ºC and air temperature inside them of 70 ºC without reduction of equipment's life expectancy and without operational interruptions.

3.2.1.2 Not air-conditioned area

- Maximum Temperature: 45 °C (ambient air)/70 ºC (panel)
- Minimum Temperature: 4 °C;
- Max. Rel. Air Humidity: 100%;
- Min. Rel. Air Humidity: 30%;
- Salinity: 1 mg of NaCl/m^3 of air.

3.2.2 Outdoors equipment

3.2.2.1 Operating conditions

- Temperature: 4 °C to 45 °C;
- Relative Air Humidity: 100%;
- Salinity: 1 mg of NaCl/m^3 of air;
- Altitude above sea level: 30 m (ship deck).

3.3 Electromagnetic Interference Sources

- UHF, VHF and SHF;
- Portable Radios, according to I-ET-3010.00-5515-762-PPT-002;
- LTE System, according to I-ET-3010.00-5512-762-PPT-002.

All equipment, panels and instrumentation devices shall comply with the standards series IEC 61000.

3.4 Vibration

3.4.1 Vibration Sources

3.4.1.1 Equipment selection and specification shall be adequate for all vibration sources, including the ones listed below. A detailed evaluation shall be conducted to identify all additional vibration sources during detailed design phase.

- Diesel generator;
- Centrifugal and reciprocating machines;
- Valves operating under cavitation;
- Cranes;
- Helicopters;
- Platform structure;
- Slamming.

3.4.2 Vibration Characteristics

3.4.2.1 Eventual

- Frequency: 5 Hz to 10 Hz;
- Period: 30 s to 1 min;
- Amplitude: ±1.0 mm.

3.4.2.2 Continuous:

- Frequency: 10 Hz to 200 Hz;
- Period: Continuous;
- Acceleration: 1.5 g.

3.5 Mechanical Shocks

3.5.1 Shock Sources

- Transportation;
- Operation.

3.5.2 Characteristics:

- Acceleration: 5 g (peak);
- Duration: Less than 10 ms;
- Frequency: Maximum of 2/s.

3.6 Storage

- Maximum Temperature: 60 °C;
- Minimum Temperature: 0 °C;
- Max. Rel. Air Humidity: 90%;
- Min. Rel. Air Humidity: 40%.

3.7 Available Power Supply

3.7.1 For instrumentation and automation equipment, available power supply is defined in technical specification I-ET-3010.00-5140-700-P4X-003 – ELECTRICAL REQUIREMENTS FOR PACKAGES FOR OFFSHORE UNITS. The different power supplies inside the panel shall be converted and distributed, including where necessary an AC/DC or DC/DC stabilized power supply unit for the cabinet internal distribution of 24 Vdc. For further details, see I-ET-3010.00-5520-888-P4X-001 – AUTOMATION PANELS.

3.7.2 All Panels, Instruments and any other equipment shall be designed and manufactured such that they are capable of operating satisfactorily under the variations of voltage, frequency and harmonic distortion of the power supply. For further details refer to I-ET-3010.00-5140-700-P4X-009 – GENERAL REQUIREMENTS FOR ELECTRICAL MATERIAL AND EQUIPMENT FOR OFFSHORE UNITS.

3.7.3 For Package Units, other power supplies will be available, depending on the specific system requirements. For details see I-ET-3010.00-5140-700-P4X-003 – ELECTRICAL REQUIREMENTS FOR PACKAGES FOR OFFSHORE UNITS;

3.8 Available Instrument Air Supply

For details about specifications for air quality, see I-RL-3010.2Q-1200-940-P4X-001 – GENERAL SPECIFICATION FOR AVAILABLE UTILITIES and I-ET-3010.00-1200-800-P4X-013 – GENERAL CRITERIA FOR INSTRUMENTATION PROJECTS.

4 TECHNICAL REQUIREMENTS

4.1 Identification Criteria

4.1.1 Refer to I-ET-3000.00-1200-940-P4X-001 – TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN.

4.2 Transmission and Control Signals

4.2.1 For Pneumatic Instrumentation and Electronic Instrumentation control signals see and I-ET-3010.00-1200-800-P4X-013 – GENERAL CRITERIA FOR INSTRUMENTATION PROJECTS.

4.2.2 Thermocouples

- Output signal in the range of millivolts (mV).

5 TESTS REQUIREMENTS

5.1 General

5.1.1 Control, safety and monitoring equipment and devices (power supplies, workstations, microcomputers, data servers, communication cards, controllers, I/O racks and network devices, among others) shall be designed to operate satisfactorily under the environmental conditions stipulated by the Classification Society and project documents.

5.1.2 In order to comply with the ambient air temperature and humidity requirements described in items 5.2 and 5.3 respectively, the equipment/devices shall be tested in accordance with I-ET-3010.00-5140-700-P4X-009 – GENERAL REQUIREMENTS FOR ELECTRICAL MATERIAL AND EQUIPMENT FOR OFFSHORE UNITS.

5.2 Ambient Air Temperature

5.2.1 For proper equipment test classification, the following locations indicated on Table 1 are foreseen:

Table 1 - Ambient air temperature by Location

Location	Range of Ambient Temperature	Range of Temperature Inside Panels, Racks and Consoles
Machinery Spaces, AEPR, CCR and other Ventilated or Air Conditioned Rooms	+ 0 °C to + 55 °C	+ 0 °C to + 70 °C
Pump Rooms	- 25 °C to + 55 °C	- 25 °C to + 70 °C
Open Deck (such as: Topsides area, Main deck, etc.)	- 25 °C to + 70 °C	- 25 °C to + 70 °C

5.3 Humidity

a) Location to avoid condensation: relative humidity up to 96% at all relevant temperatures;
b) General: relative humidity up to 100% at all relevant temperatures.

5.3.1 CANCELED.

5.4 Salt Mist

5.4.1 The applicable salt-contamination atmosphere is to be 1 mg/m^3 of air, at all relevant temperatures and humidity conditions. In order to comply with this salt mist requirement, the equipment shall be subjected to specific test severity in accordance with IEC 60092-504. The test procedure shall be in accordance with IEC 60068-2-52 Test Kb.

5.5 Electromagnetic Compatibility

5.5.1 Electronic equipment shall be designed to operate properly under conducted and radiated disturbance levels and shall not affect the operation of any other equipment or system. The equipment shall be subjected to the specific type tests procedures and severity listed in Table 3.

Table 3 – Type tests for electromagnetic compatibility approval

Test	Procedure	Severity
Electrostatic discharge	IEC 61000-4-2 level 3 severity standard	IEC 60092-504
Electromagnetic field	IEC 61000-4-3 level 3 severity standard	
Conducted radio frequency interference	IEC 61000-4-6 level 2 severity standard	
Conducted fast transients (burst)	IEC 61000-4-4 level 3 severity standard	
Conducted slow transients (surge)	IEC 61000-4-5 level 2 severity standard	
Radiated emissions	IEC CISPR 16-1; CISPR 16-2	
Conducted emissions	IEC CISPR 16-1; CISPR 16-2	

5.6 Vibration

5.6.1 The vibration levels are those indicated in IEC 60092-504. The test procedure shall be in accordance with IEC 60068-2-6 Test Fc.

5.7 Power Supply Variations

5.7.1 CANCELED.

5.7.2 In order to guarantee the properly operation under power supply conditions, described in item 3.7 the equipment shall be tested to the type tests procedures and severity listed below:

5.7.3 Power Supply Failure

5.7.3.1 The test conditions for power supply failure are those indicated in IEC 60092-504 and the test procedure shall be in accordance with IEC 61000-4-11.

5.7.4 Power Supply Variations

5.7.4.1 The test conditions for power supply variations shall be in accordance with I-ET-3010.00-5140-700-P4X-009 – GENERAL REQUIREMENTS FOR ELECTRICAL MATERIAL AND EQUIPMENT FOR OFFSHORE UNITS.

5.7.4.2 The test procedure for power supply variations shall be in accordance with IEC 61000-4-11.

5.7.5 Conducted Low Frequency Interference (harmonics)

5.7.5.1 The test conditions for harmonic distortion are those indicated in IEC 60092-504 and the test procedure shall be in accordance with IEC 60533.

5.8 Insulation Resistance

5.8.1 The insulation resistance applicable to electrical and electronic equipment is those indicated in IEC 60092-504.

5.9 Inclinations

5.9.1 The functional tests are performed at the rated operational voltage. The severities shall be in accordance with IEC 60092-504. The testing conditions are the following ones:

- Static test:
  - Inclination to the vertical at an angle of at least 22.5°, then inclination to at least 22.5° on the other side of the vertical and in the same plane;
  - Inclination to the vertical at an angle of at least 22.5° in plane at right angle to the one used previously, then inclination to at least 22.5° on the other side of the vertical and in the same plane;
- Dynamic test:
  - The equipment is to be rolled to an angle of 22.5° each side of the vertical with a period of 10 s;
  - The test in each direction is to be carried out for not less than 15 min.