	TECHNICAL SPECIFICATION		Nº. I-ET-3010.1M-1200-940-P4X-002
	CLIENT:	SRGE	SHEET: 1 of 11
	JOB:	REFERENCE BASIC DESIGN	1001056398 0010
	AREA:	BÚZIOS	
DP&T-SRGE	TITLE:	CORROSION MONITORING SYSTEM	NP-1 ESUP

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DATE	MAR/15/19								
DESIGN	ESUP								
EXECUTION	MMARROIG								
CHECK	FABIANA								
APPROVAL	TMCAMPOS								

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FORM OWNED TO PETROBRAS N-0381 REV.L.



PETROBRAS

TECHNICAL SPECIFICATION

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ESUP

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PRELIMINARY



PETROBRAS

TECHNICAL SPECIFICATION

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SHEET: 3 of 11

TITLE: **CORROSION MONITORING SYSTEM**

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ESUP

1 SCOPE

This specification covers the minimum requirements for design and assembly of corrosion monitoring systems to be supplied to **PETROBRAS**.

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.

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 PACKAGER/MANUFACTURER may revert to PETROBRAS for clarification.

2.1 CLASSIFICATION

CONTRACTOR/ MANUFACTURER shall perform the work in accordance with the requirements of Classification Society.

CONTRACTOR/ MANUFACTURER 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.


- API RP-505 - Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone I and Zone 2
- IEC-60092-502 - Electrical Installations in Ships
- IEC-61892-7 - Mobile and Fixed Offshore Units - Electrical Installations.
- ASME B16.11 - Forged Steel Fittings, Socket-Welding and Threaded
- ISO 12944 - Paints and Varnishes - Corrosion Protection of Steel Structures by Protective Paint Systems
- ASME B16.5 - Pipe Flanges and Flanged Fittings
- ASME B31.3 - Process Piping
- IEC 61892-6 - Mobile and Fixed Offshore Units – Electrical Installations – Installation
- ISO 15156 - Petroleum, petrochemical, and natural gas industries — Materials for use in H₂S-containing environments in oil and gas production
- NACE SP 0775 - Preparation, Installation, Analysis, and Interpretation of Corrosion Coupons in Oilfield Operations
- ISO 21457 - Petroleum, petrochemical and natural gas industries -- Materials selection and corrosion control for oil and gas production systems

2.3 GOVERNAMENTAL 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)

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- NR-37 Saúde e Segurança em Plataformas			
Brazilian Government regulations are mandatory and shall prevail, if more stringent, over the requirements of this specification and other references herein.			
2.4 DESIGN SPECIFICATIONS			
DR-ENGP-M-I-1.3	-	SAFETY ENGINEERING	
DR-ENGP-I-1.15	-	COLOR CODING	
I-DE-3010.1M-5400-94A-P4X-001	-	AREA CLASSIFICATION – GENERAL	
I-DE-3010.1M-1200-942-P4X-002	-	GENERAL ARRANGEMENT	
I-ET-3010.1M-1200-940-P4X-003	-	CHEMICAL INJECTION POINTS	
I-ET-3000.00-1200-940-P4X-001	-	TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN.	
I-ET-3010.00-1200-955-P4X-001	-	WELDING	
I-ET-3010.00-1200-955-P4X-002	-	REQUIREMENTS FOR WELDING INSPECTION	
I-ET-3010.00-1200-800-P4X-002	-	AUTOMATION, CONTROL AND INSTRUMENTATION ON PACKAGE UNITS	
I-ET-3010.00-1200-956-P4X-002	-	GENERAL PAINTING	
I-ET-3010.1M-1200-200-P4X-001	-	PIPING SPECIFICATION FOR TOPSIDE	
I-ET-3010.00-1200-859-P4X-001	-	AUTOMATION REQUIREMENTS FOR CORROSION MONITORING SYSTEM (CMS)	
I-ET-3A36.00-1000-941-PPC-001	-	METOCEAN DATA	
I-RL-3010.1M-1350-960-P4X-009	-	MOTION ANALYSIS	
2.5 CONFLICTING REQUIREMENTS			
2.5.1 In case of conflicting information between this Specification (ET) and other specific PETROBRAS' document (data sheet) the specific PETROBRAS' document shall prevail.			
2.5.2 In all cases of conflict between this specification and applicable documents listed herein, the more stringent requirements shall prevail. In such cases, CONTRACTOR/MANUFACTURER shall inform PETROBRAS of the conflict and seek clarification.			
3 DESIGN REQUIREMENTS			
3.1 GENERAL DESIGN REQUIREMENTS			
3.1.1 The corrosion monitoring system project shall be submitted to Classification Society, when required, for comments and its approval.			
3.1.2 All components of the corrosion monitoring systems shall be suitable for marine environment according to class CX of ISO 12944 Part 2.			
3.1.3 The access fitting shall be design according to ASME B31.3. The fittings shall be as per ASME B16.11 and ASME B16.15.			
3.1.4 All the access fittings shall be specified for welded connection.			
3.1.5 The access fittings shall be hydraulic type. Mechanical access fittings may be acceptable provided previous PETROBRAS approval.			

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<p>3.1.6 The corrosion monitoring technics are specified at ANNEX 1, and are intrusive techniques type solid plug, type electrical resistance probe, linear polarization probe and non-intrusive techniques.</p> <p>3.2 SOLID PLUG:</p> <p>3.2.1 The solid plug shall be mounted with two types of coupon holders depending on the system:</p> <p>a) For water systems: Strip coupon holder, fixed length (110 mm).</p> <p>b) For gas and oil systems: Disc coupon holder, adjustable length, flush mounted.</p> <p>Note: The length of the disc coupon holder shall be calculated according to pipe information located in ANNEX 1.</p> <p>3.3 PROBES SPECIFICATION:</p> <p>3.3.1 Electrical resistance probes (ER probes) shall be adjustable length with a sensing element suitable for environments with high content of H₂S.</p> <p>3.3.2 Linear polarization (LPR probes) and galvanic probes shall be fixed length two electrode projecting types.</p> <p>3.3.3 Probes used in pipeline systems that are subject to pigging operations shall be flush mounted type.</p> <p>3.3.4 Otherwise requested different by the client representative, only high sensibility cylindrical type probes shall be selected.</p> <p>3.4 NON-INTRUSIVE CORROSION MONITORING DEVICES:</p> <p>3.4.1 Non-intrusive corrosion monitoring devices shall be able to determine corrosion rates and mass loss due to corrosion (localized or generalized) or erosion in a pipeline. The devices shall be based on the principle of electrical resistance or ultrasonic. Other types of devices may be acceptable under previous approval of PETROBRAS.</p> <p>3.4.2 Non-intrusive corrosion monitoring device consist of the following components:</p>			

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<p>3.4.2.1 A reference metal plate, obtained from the pipe (for electrical resistance only)</p> <p>3.4.2.2 For punctual measurement: A sensing pins spot welded or transducers installed externally to the pipeline over the point to be monitored.</p> <p>3.4.2.3 For section measurement: An array of sensing pins (spot welded) or transducers installed externally to the pipeline over the section to be monitored, to perform measurement of a matrix allowing the construction of a map in function of thickness loss;</p> <p>3.4.2.4 An electronic device for data acquisition, which allows the processing and storage of measurements</p> <p>3.4.2.5 A transmitter, for acquisition and storage (data logger), with the ability to send this information remotely. The monitoring variables shall be sent to a database that is managed by PETROBRAS.</p> <p>3.4.2.6 Cables for interconnection between system components</p> <p>3.4.2.7 Battery that allows normal operation of the equipment for at least 4 years in case of power failure or if external power supply is not available.</p> <p>3.4.2.8 Software of real time monitoring of the measurements made, generation of graphics and corrosion analysis (localized or generalized) and erosion;</p> <p>3.4.2.9 External thermal coating and/or mechanical protection, in places where the sensing pins and the reference plate were installed, aiming standardization of the temperature.</p> <p>3.4.3 The requirements of I-ET-3010.00-1200-859-P4X-001 - AUTOMATION REQUIREMENTS FOR CORROSION MONITORING SYSTEM (CMS) are applicable.</p> <p>3.5 LOCATION OF POINTS FOR CORROSION MONITORING:</p> <p>3.5.1 The access fittings in oil and gas systems shall be horizontally installed on straight pipe sections at the position pipe bottom 6.0 o'clock position.</p> <p>3.5.2 The access fittings in water systems with monophasic flow (without stratification or biphasic flow) may be installed in any generatriz of piping, being also accepted the installation in vertical piping. In case of other flow condition, the points shall be installed at the 6.0 o'clock position</p> <p>3.5.3 The corrosion monitoring points shall be located at a minimum distance of 5 times the piping diameter from any piping accident, like bands, tees and valves that may cause turbulence, unless otherwise specified.</p> <p>3.5.4 The corrosion monitoring points shall be installed downstream of chemical injection points</p> <p>3.5.5 Every corrosion monitoring point shall have adequate clearance the operation of the recovery tool. The clearance shall be at least one free cylindrical area of 50.0 cm radius and 2.0 m in length with respect to the connection of the monitoring point, according to Figure 1 and Figure 2.</p>			

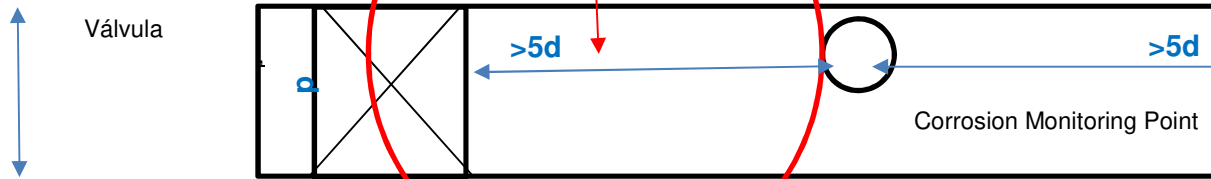


Figure 1- Superior view

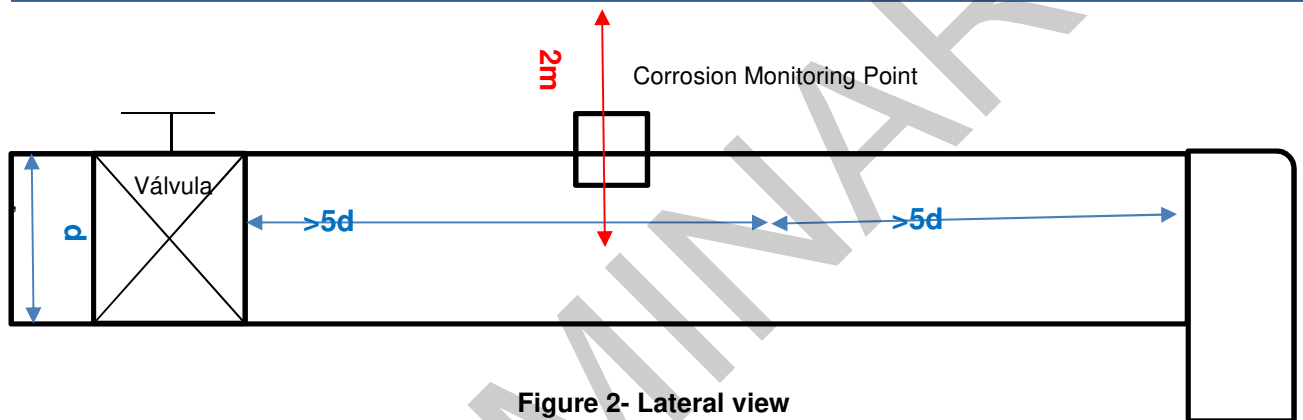


Figure 2- Lateral view

3.5.6 Corrosion monitoring points shall have access provided in the design through access structures (ladders and platforms). Where this is not possible, the monitoring points shall be at a maximum floor height of 3.5 m in order to facilitate access via scaffolding or ladders. Curva

3.5.7 No corrosion monitoring point shall be positioned over the sea.

3.6 WELDING

3.6.1 The welding shall be in accordance with I-ET-3010.00-1200-955-P4X-001- WELDING. All welds shall be categorized as inspection class IV and shall be inspected as required in I-ET-3010.00-1200-955-P4X-002 – WELDING INSPECTION.


3.6.2 The welding of the access fitting shall precede the drilling of the hole on the sampling point.


3.6.3 After the access fitting welding, a hydrostatic test shall be done and the last thing shall be the hole drilling on the sampling point. Alternatively the weld shall be tested during the hydrostatic test of the pipe system or equipment and, in this case, the hole shall be done previously to the hydrostatic test.

3.6.4 The drilling shall be done using a HTM (Hot Tap Machine) with drilling bit of diameter 35 mm.

3.6.5 Fillet welds shall not be used to weld the access fitting body to pipe or equipment. Fillet welds in other parts of access fitting may be acceptable, provided that receive Toe gridding or TIG dressing to avoid fatigue cracks.

3.7 MATERIALS SPECIFICATION:

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<p>3.7.1 The access fittings shall be in accordance with the I-ET-3010.1M-1200-200-P4X-001-PIPING SPECIFICATION FOR TOPSIDE.</p> <p>3.7.2 The access fitting cannot limit the piping system pressure, so its material and pressure design shall be compatible with the piping being welded at.</p> <p>3.7.3 Internal components, such as plugs, probes, and coupon holders, shall be in a corrosion resistant material under the operating conditions and process fluids involved, and conform to the specific technical requirements of standards and design. The CONTRACTOR is the responsible for the materials specification for those internal parts.</p> <p>3.8 PAINTING</p> <p>3.8.1 Paint system for external coating shall be according to I-ET-3010.00-1200-956-P4X-002 – GENERAL PAINTING.</p> <p>3.8.2 Color code shall comply with DR-ENGP-I-1.15 – COLOR CODING</p> <p>4 SCOPE OF SUPPLY AND SERVICES</p> <p>4.1.1 The access fittings shall be hydraulic type. Mechanical access fittings may be acceptable provided previous PETROBRAS approval.</p> <p>4.1.2 A complete retrieval tool kit and a manual data collector is in the scope of supply.</p> <p>4.1.3 The corrosion monitoring system and the access fittings should be from only one supplier. Different suppliers may be accepted if their corrosion monitoring systems and access fittings are interchangeable. In this case the prior approval of PETROBRAS is required.</p> <p>4.1.4 For automation system see I-ET-3010.00-1200-859-P4X-001 - AUTOMATION REQUIREMENTS FOR CORROSION MONITORING SYSTEM (CMS)</p> <p>4.1.5 The scope of supply includes, but is not limited to:</p> <ol style="list-style-type: none"> Executive procedures of installation and commissioning Datasheets of equipment. Material certificates Welding documentation Drawings for each equipment; Installation drawings including general arrangement, electrical diagrams, wiring diagrams, cable list, material list, equipment list; Supply of equipment, materials and accessories required to carry out the construction, installation and pre-operation of the system, as well as spare parts required for two years of operation. FAT of automation systems Installation and commissioning of the corrosion monitoring system Supply of operational manual, inspection and maintenance. Execution of training, including the topics related to nonintrusive techniques, real time monitoring, and the software. Warranty <p>5 CERTIFICATIONS REQUIREMENTS</p>			

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5.1 CLASS CERTIFICATION			
5.1.1 The corrosion monitoring system project shall be submitted to Classification Society, when required, for comments and its approval.			
5.2 GENERAL CERTIFICATION			
5.2.1 CONTRACTOR/ MANUFACTURER shall be responsible for obtaining all required certification of the equipment.			
5.2.2 CONTRACTOR/ 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.			
6 TAGS AND SAFETY SIGNS			
6.1.1 When applicable, tagging of all instrumentation, electrical, mechanical, and piping items, including valves, shall be in accordance with latest revision of I-ET-3000.00-1200-940-P4X-001 - TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN.			
6.1.2 The main items shall have individual tag numbers as dictated by PETROBRAS. The actual tag numbers will be advised to the PACKAGER after award.			
6.1.3 Tags shall be supplied with the number and description in English, unless otherwise stated in the project data sheets.			
6.1.4 Tag numbers for remaining ancillary equipment shall be given after Purchase Order placement.			
6.1.5 All safety signs shall be in Portuguese.			
7 INSPECTION, TESTING AND COMISSIONING			
7.1 INSPECTION			
7.1.1 CONTRACTOR shall submit an ITP for the corrosion monitoring system.			
7.1.2 PETROBRAS shall identify all the required witnessed inspections on a marked up copy of the ITP.			
7.1.3 PETROBRAS reserve the right to inspect the equipment anytime during fabrication and assembly to ensure that material and workmanship are in accordance with this specification.			
7.1.4 CONTRACTOR shall ensure that all the witnessed inspection requirements by the classification society are met and due notice is given.			
7.1.5 The notification period for such inspections shall be mutually agreed upon during the kick-off meeting.			
7.1.6 The following inspections and checks may be witnessed by PETROBRAS:			
a. Verification of the construction materials of the equipment for conformity with the requirements of the specification;			

- b. Verification that piping and fittings conform with specification of materials and fabrication;
- c. Inspection by radiographic, dye penetrant, magnetic particles, ultrasonic inspection of welds of the pressure retaining parts;
- d. A visual check noting:
 - a. That the thickness of pressure retaining parts meets or exceeds the quoted design thickness;
 - b. Any repairs;
 - c. General appearance, materials, workmanship and finish standard are acceptable;
- e. Dimensional check;
- f. Alignment check to be demonstrated;
- g. All instrumentation, control panels and ancillary equipment shall be built, checked, tested and function tested prior to installation as defined in the specification.

7.2 ASSEMBLY ASSISTANCE AND COMMISSIONING REQUIREMENTS

- 7.2.1 CONTRACTOR is responsible for assembly supervision of the equipment, including assembly of components delivered loose (for example, vessel internals etc.).
- 7.2.2 CONTRACTOR 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.


7.3 FIELD SERVICES

- 7.3.1 Verification of mounting, configuration and operation accompaniment of system and SAT during 5 (five) days of installed monitoring system and maintenance and operation training during 2 (two) days for 2 (two) teams up to 10 (ten) students in platform.
- 7.3.2 The services shall be executed by 1 (one) technical specialist of the system manufacturer in 1 (one) travel during 7 (seven) days in platform.

NOTE: All costs of transport, lodging and alimentation until the work local are in the scope of manufacturer of the system.

7.4 WARRANTY

- 7.4.1 CONTRACTOR shall give warranty for all components, even for equipment or device furnished by others, up to 24 (twenty four) months from delivery or for 12 (twelve) month operation.
- 7.4.2 This warranty shall cover fabrication or installation problems, as well as any service included in the scope of supply.
- 7.4.3 Furnisher shall warranty the supply of spare parts, at least, for up to 10 (ten) years after the acceptance test date, and technical assistance at installation site performed by qualified and certified maintenance staff, when requested.
- 7.4.4 During warranty period, any defective part shall be changed for a new one, within one week, after the problem report by PURCHASER.

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ANNEX 1 - CORROSION MONITORING SYSTEM FOR THE PROJECT:

The number of sampling points, the corrosion monitoring techniques, the P&ID's and all relevant information about the corrosion monitoring system are shown in the Table below.

Location		Pipe information		Solid plug	Probe	Non-intrusive	High pressure	Data collection	Access fitting
System	PI&D	TAG	SCH						
U-1223	I-DE-3010.1M-1223-944-P4X-002	12"-PCW-C11-001-PP	0.312"		ER ¹		NO	ONLINE	SSDS
U-1223	I-DE-3010.1M-1223-944-P4X-001	24"-PC-H12-195-HC	1.812"			x	YES	ONLINE	SSDS
U-1223					ER		NO	ONLINE	
U-1231							YES	ONLINE	
U-1252	HOLD	HOLD				x			
U-1238									
U-1233									
U-1234									
U-1235									
U-1254									
U-5124	HOLD	HOLD		x	ER				
U-5125	HOLD	HOLD		x	ER				
U-1251	HOLD	HOLD		x	ER, GALVANICA				

NOTE: (1) The probe is not to be installed at access point.