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	CLIENT:	SRGE	SHEET 1 of 16
	JOB:	REFERENCE BASIC DESIGN	1001056398 0010
	AREA:	BÚZIOS	
DP&T-SRGE	TITLE: PRODUCTION WELL CONTROL RACK		NP-1 ESUP

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DATE	NOV/13/18	AUG/28/19							
DESIGN	ESUP	ESUP							
EXECUTION	RAFAELGOMES	GNIEDU							
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APPROVAL	RAFAELJOSE	ANDRÉ LUIS							

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FORM OWNED TO PETROBRAS N-0381 REV.L.



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PRELIMINARY

1 INTRODUCTION

1.1 Objective

1.1.1 This technical specification describes the minimum requirements and basic characteristics for the supply of the Production Well Control Rack for UNIT.

1.1.2 One (01) Production Well Control Rack shall be supplied (PN-1210008).

1.2 Definitions

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

1.3 Abbreviations

The following abbreviations are used in this document:

A&C	Automation & Control
AMV	Master 2 Valve (M2)
AWV	Wing 2 Valve (W2)
COV	Crossover Valve (XO)
CSS	Control and Safety System
FAT	Factory Acceptance Test
HPR	High Pressure Level
HPU	Hydraulic Power Unit
LPR	Low Pressure Level
PCOV	Pig Crossover Valve (PXO)
PMV	Master 1 Valve (M1)
PWV	Wing 1 Valve (W1)
SAT	Site Acceptance Test
SCIAC	Wet Christmas Trees Deployed by Cable
SCSSV	Subsurface Controlled Subsea Safety Valve
SIT	Site Integration Test
VHIF-I	Hydraulic Valve for Isolation Formation – Inferior
WCT	Wet Christmas Trees

2 REFERENCE DOCUMENTS, CODES AND STANDARDS

2.1 Internal References

2.1.1 Project Documents

I-DE-3010.1M-5520-800-P4X-002	AUTOMATION AND CONTROL ARCHITECTURE
I-DE-3010.1M-1210-888-P4X-002	PRODUCTION WELL CONTROL RACK - FUNCTIONAL DIAGRAM
I-DE-3010.1M-1210-888-P4X-001	PRODUCTION WELL CONTROL RACK - LAYOUT
I-ET-3010.00-1210-390-P4X-001	HYDRAULIC POWER UNIT (HPU) FOR SUBSEA SYSTEM
I-ET-3010.00-5140-700-P4X-003	ELECTRICAL REQUIREMENTS FOR PACKAGES FOR OFFSHORE UNITS
I-ET-3010.1M-1200-800-P4X-005	FIELD INSTRUMENTATION
I-ET-3010.00-1200-800-P4X-013	GENERAL CRITERIA FOR INSTRUMENTATION PROJECTS
I-MD-3010.1M-5520-800-P4X-001	AUTOMATION AND CONTROL SYSTEM FUNCTIONS - TOPSIDES

2.2 External References

2.2.1 International Codes, Recommended Practices and Standards

API - AMERICAN PETROLEUM INSTITUTE

API	RP-14B	DESIGN, INSTALLATION AND OPERATION OF SUBSURFACE SAFETY VALVE SYSTEM
API	RP-14C	ANALYSIS, DESIGN, INSTALLATION AND TESTING OF BASIC SURFACE SAFETY ON OFFSHORE PRODUCTION PLATFORMS
API	RP-14D	SPECIFICATION FOR WELLHEAD SURFACE VALVE FOR OFFSHORE SERVICE
API	RP-14F	DESIGN AND INSTALLATION OF ELECTRICAL SYSTEMS FOR OFFSHORE PRODUCTION PLATFORMS

IEC - INTERNATIONAL ELECTROTECHNICAL COMMISSION

IEC	60079	ELECTRICAL APPARATUS FOR EXPLOSIVE GAS ATMOSPHERES – ALL PARTS
IEC	60529	DEGREES OF PROTECTION PROVIDED BY ENCLOSURES (IP CODE)
IEC	60533	ELECTRICAL AND ELECTRONIC INSTALLATIONS IN SHIPS - ELECTROMAGNETIC COMPATIBILITY



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IEC 61000 ELECTROMAGNETIC COMPATIBILITY (EMC) SERIES - ALL PARTS

INMETRO - INSTITUTO NACIONAL DE METROLOGIA, NORMALIZAÇÃO E QUALIDADE INDUSTRIAL

PORTARIA Nº 179 (18/MAIO/2010) REGULAMENTO DE AVALIAÇÃO DA CONFORMIDADE PARA EQUIPAMENTOS ELÉTRICOS PARA ATMOSFERAS EXPLOSIVAS, NAS CONDIÇÕES DE GASES E VAPORES INFLAMÁVEIS E POEIRAS COMBUSTÍVEIS.

PORTARIA Nº 89 (23/FEVEREIRO/2012) ALTERAÇÃO DA PORTARIA INMETRO Nº 179, DE 18/MAIO/2010.

ISO – INTERNATIONAL STANDARD ORGANIZATION

ISO 4406 HYDRAULIC FLUID POWER - FLUIDS - METHOD FOR CODING OF THE CONTAMINATION BY SOLID PARTICLES

ISO 13628-6 PETROLEUM AND NATURAL GAS INDUSTRIES – DESIGN AND OPERATION OF SUBSEA PRODUCTION SYSTEMS – PART 6: SUBSEA PRODUCTION CONTROL SYSTEMS, 2ND EDITION, 2006

ISO 16889 HYDRAULIC FLUID POWER -- FILTERS -- MULTI-PASS METHOD FOR EVALUATING FILTRATION PERFORMANCE OF A FILTER ELEMENT, EDITION, 2008

2.2.2 Classification Society

2.2.2.1 The FPSO basic design follows the requirements of Classification Society and its rules and comments were taken into account at the documents.

2.2.2.2 The detailed design shall also be submitted to approval by the same Classification Society. The design and installation shall take into account their requirements and comments.

2.2.2.3 The design, installation and operation shall strictly follow the Classification Society requirements, together with the specific requirements identified in this document, including also all referenced documents requirements.

2.2.3 Certification

2.2.3.1 To prove compliance with area classification, Certificates of Conformity in accordance with “PORTARIA INMETRO Nº 179, de 18/maio/2010”, and its annexes, changed by “PORTARIA INMETRO Nº 89 de 23/fevereiro/2012”, shall be supplied.

2.2.4 Order of Precedence

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2.2.4.1 Regarding to minimize conflicts among project documents, except where specific codes and regulations are more stringent, the order of precedence of technical documents shall otherwise be:

- This Specification;
- Project Documents listed on item 2.1.1 above;
- Codes and Standards;

3 OPERATIONAL CONDITIONS

3.1 The Production Well Control Rack shall be installed in open area, hence, all its components shall be adequate to work in the following environmental conditions:

- Temperature: 4 °C to 45 °C;
- Relative humidity of air: 100 %;
- Altitude: 30 m;
- Saline environment: 1 mg de NaCl/m³ of air.

3.2 The Production Well Control Rack shall be for installation in Zone 2, Group IIA, T3 Classified areas according to IEC-60079 standard. However, according to IEC 61892-7, the rack and all of its components shall be suitable for Zone 1, Group IIA and temperature class T3.

3.3 The rack shall use a water based hydraulic fluid with 3 (three) µm absolute filtering (see item 3.8).

3.4 Power supply available to Well Control Rack: 24Vdc +10% - 15% (voltage drop on cable not included)

3.5 The hydraulic power for the production well valves with direct control will be provided by the UH-1210001 (see I-ET-3010.00-1210-390-P4X-001 – HYDRAULIC POWER UNIT (HPU) FOR SUBSEA SYSTEM). The Production Well Control Rack shall have 2 (two) inlet for hydraulic supply, one of high pressure levels, and one for the low pressure level. The pressure levels shall be as following:

- HIGH PRESSURE LEVEL 10K (HPR10K): nominal pressure of 68,947 kPa (10,000 psi) operation, adjustable from 44,845 kPa (6,500 psi) up to 68,947 kPa (10,000 psi) for SCSSV and VHIF-I valves;
- HIGH PRESSURE LEVEL 5K (HPR5K): nominal pressure of 34,473 kPa (5,000 psi) operation, adjustable from 27,579 kPa (4,000 psi) up to 34,473 kPa (5,000 psi) for SCSSV and VHIF-I valves;

NOTE: The interconnection of HPR10K and HPR5K supplies between HPU and Production Well Control Rack shall be mutually exclusive.

- LOW PRESSURE LEVEL (LPR): nominal pressure of 34,473 kPa (5,000 psi) for operation of the Xmas Tree valves of production wells (AWV, PWV, AMV, PMV, COV and PCOV), adjustable from 20,684 kPa (3,000 psi) up to 34,473 kPa (5,000 psi)



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NOTE 1: The pressure levels above shall be confirmed by the specific field layout design basis, in order to verify if higher values (i.e.10,000 psi) are needed for Christmas Trees and SCSSV valves.

NOTE 2: The hydraulic pressure levels shall be confirmed during detailing design phase.

3.6 The Production Well Control Rack shall be suitable for operation with any of the following three hydraulic fluids: MacDermid Oceanic HW525P, HW443 or Castrol Transaqua DW. The use of HW525P or HW443 depends if the rack is in operation, pre-operation or in preservation.

3.7 Operation Hydraulic Fluid

3.7.1 The Production Well Control Rack fluid shall be MacDermid Oceanic HW 525P or Castrol Transaqua DW (choice to be later taken by PETROBRAS).

NOTE: Such fluids shall not be indiscriminately mixed, it being accepted only the migration of use from one to the other, with a minimum 12 (twelve) month waiting period for a new migration mixture.

3.8 Preservation Hydraulic Fluid until Pre-Operation phase

3.8.1 In case PETROBRAS specifies MacDermid Oceanic HW 525P fluid, the Rack hydraulic circuit shall be filled with MacDermid Oceanic HW 443 hydraulic fluid from manufacturing until just before pre-operation phase in Brazil, aiming at internal protection against corrosion from the vapor phase of the fluid during possible long weather storage period. In such cases, the HW 443 fluid shall be substituted by HW 525 during the final phase of commissioning and pre-operation in Brazil.

3.8.2 In case PETROBRAS specifies Castrol Transaqua DW fluid, the Rack shall be filled with the same hydraulic fluid from manufacturing until just before pre-operation phase in Brazil, aiming at internal protection against corrosion from the vapor phase of the fluid during possible long storage periods exposed to the elements. In such cases, only completing of the fluid is necessary at the end of the commissioning and pre-operation phase in Brazil.

3.9 Hydraulic Fluid Cleanliness Class

3.9.1 The Production Well Control Rack shall be appropriate to operate with Cleanliness Class 19/17/14 according to ISO 4406 (equivalent to Class 8 of NAS1638 Standard). However, the nominal fluid cleanliness class shall be ISO 4406 17/15/12 (equivalent to Class 6 of NAS1638 Standard).

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4 CONSTRUCTION REQUIREMENTS

4.1 General Requirements

- 4.1.1 The Production Well Control Rack structure shall be modular self-supported closed type panel, with the possibility of actuation of up to 02 (two) wells each.
- 4.1.2 The rack shall have 2 (two) front doors and 2 (two) rear doors, all with transparent polycarbonate windows to allow visualization of the state open/closed of the control valves. The access doors shall allow easy access to the whole extension of the rack, and be fixed by means of continuous hinges made of AISI-316L. The door knobs shall be reinforced.
- 4.1.3 The rack shall be built of at least AISI-316L stainless steel specification shapes and sheets.
- 4.1.4 The rack dimensions shall be in accordance with the typical layout I-DE-3010.1M-1210-888-P4X-001 - PRODUCTION WELL CONTROL RACK - LAYOUT.
- 4.1.5 All cuts and drilling operations shall be done cold.
- 4.1.6 All pneumatic and hydraulic lines, connections, valves and other internal accessories to the panels, shall be made of AISI-316 stainless steel.
- 4.1.7 AISI-316L stainless steel shall be used in the manufacture of the supporting skid. The panel plates shall be free of warping, wrinkling, roughness, signs of rust and corrosion, and they shall have the same minimum thickness of 3.175 mm for sides, ceiling, bottom, and doors, and 4.760 mm for panel front side.

5 CONNECTIONS AND TUBINGS

- 5.1 All tubing and fittings shall be in accordance with I-ET-3010.00-1200-800-P4X-013 - GENERAL CRITERIA FOR INSTRUMENTATION PROJECTS.
- 5.2 All lines and components operating with hydraulic fluid shall be sized with a 3:1 safety factor.
- 5.3 If cone and thread is used, the hydraulic lines (tubings) and fittings shall be furnished by the same MANUFACTURER, which shall also furnish all specific documentation, including connections assembly and disassembly procedures for each line size, any required special tools and training for tubing fitting assembly.



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- 5.4 The removal of any component shall be preferably executed from the front part of the rack and shall not require the removal of other circuits than the one that is being fixed.
- 5.5 The connection with the well control rack shall be made at the lower part of the rack through a bulkhead type connection, in line, or at most in two lines where one is shifted related to the other at half the distance between the connections, to allow connection or disconnection of any line without interfering with the others.
- 5.6 All lines shall be adequately supported and arranged in a way to avoid damage when in operation, facilitate maintenance and minimize their respective lengths.
- 5.7 All hydraulic connections in the Water Injection Well Control Rack shall have a capacity to preserve their sealing for at least 25 years of service.
- 5.8 If sealant is used in threaded connections, seal shall be made by chemical thread sealant. The usage of Teflon Tape is not allowed.

6 RACK INLETS AND OUTLETS

6.1 Hydraulic Outlets

- 6.1.1 1 (one) hydraulic fluid return outlet of rated LEVEL HPR10K or HPR5K for SCSSV and VHIF-I with 2" (minimum) diameter, with a compression type fitting. The actual pressure level of this outlet shall be in accordance with SCSSV pressure command level. This information will be given by PETROBRAS during the Detail Engineering Design.
- 6.1.2 1 (one) hydraulic fluid return outlet of rated LEVEL LPR for the actuation of the other WCT valves with 2" (minimum) diameter, with a compression type fitting;
- 6.1.3 4 (four) outlets of rated level HPR5K or HPR10K, for the actuation of the VHIF-I valves, in 3/8" OD tubing with adaptation for a union type outlet for the panel, 9/16" - 18 JIC 37°, class 10,000 psi. The actual pressure level of this outlet shall be in accordance with SCSSV pressure command level. This information will be given by PETROBRAS during the Detail Engineering Design.

NOTE: For wells with WCT deployed by cable (SCIAC), there shall be 2 (two) outlets to VHIF-I's actuator of double action.

- 6.1.4 2 (two) outlets of rated level HPR5K or HPR10K, for the actuation of the DHSV valves, in 3/8" OD tubing with adaptation for a union type outlet for the panel, 9/16" - 18 JIC 37°, class 10,000 psi. The actual pressure level of this outlet shall be in accordance with SCSSV pressure command level. This information will be given by PETROBRAS during the Detail Engineering Design.

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6.1.5 12 (twelve) outlets of lower pressure level LPR, for the actuation of the others Christmas Tree valves, in 3/8" OD tubing with adaptation for a union type outlet for the panel, 9/16" - 18 JIC 37°, class 6,000 psi.

NOTE 1: Each production well has 6 (six) hydraulic single action function devices for actuating Xmas Tree valves: wing2 (AWV), wing1 (PWV), crossover (COV), master2 (AMV), master1 (PMV) and pig crossover (PCOV), in addition to the SCSSV and VHIF-I valves.

NOTE 2: Hydraulic outlet diameters shall be confirmed during project's detailing design phase.

6.2 Hydraulic inlets

6.2.1 1 (one) inlet for either one of the 2 (two) levels of pressure:

- LEVEL HPR10K of hydraulic fluid supply for VHIF-I and SCSSV valves, in 1" OD tubing.
- LEVEL HPR5K of hydraulic fluid supply for VHIF-I and SCSSV valves, in 1" OD tubing.

NOTE: The interconnection of HPR10K and HPR5K supplies between HPU and Production Well Control Rack shall be mutually exclusive. The actual pressure level of this inlet shall be in accordance with SCSSV pressure command level. This information will be given by PETROBRAS during the Detail Engineering Design.

6.2.2 1 (one) inlet at pressure LEVEL LPR of hydraulic fluid supply for the other Christmas Tree valves.

NOTE: Hydraulic inlet diameters shall be confirmed during project development.

6.3 Electric Inlets

6.3.1 14 (fourteen) Inlets for the actuation of the solenoid valves (in 24 Vdc) by CSS.

6.4 Electric outlets

6.4.1 2 (three) outlets for remote pressure monitoring (Analog signal 4-20mA).

6.4.2 14 (fourteen) outlets for remote status valve status (discrete signal, voltage free contact).

6.4.3 2 (two) outlets for remote pressure alarm (discrete signal, voltage free contact).

6.4.4 The panel rack shall be provided with, at least, 1 (one) junction box for FPSO interconnection. Junction Boxes shall be specified in accordance with I-ET-



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3010.00-1200-800-P4X-013 - GENERAL CRITERIA FOR INSTRUMENTATION PROJECTS.

- 6.4.5 Junction boxes shall be supplied with SAK 2.5 mm² terminals.
- 6.4.6 The cables that conduct the signals from the transmitters to the junction box shall have electrostatic shields that shall not be grounded but rather connected to the terminal at the junction box.
- 6.4.7 All cased electric devices shall have IP-56 protection level.

7 INSTRUMENTATION

- 7.1 Instrumentation shall be in accordance with the document I-ET-3010.00-1200-800-P4X-013 - GENERAL CRITERIA FOR INSTRUMENTATION PROJECTS.
- 7.2 All panels, instruments, materials and equipment proper to be used in hazardous areas, shall have conformity certificates complying with "PORTARIA INMETRO Nº 179, de 18/maio/2010", and its annexes, changed by "PORTARIA INMETRO Nº 89, de 23/fevereiro/2012" and its annexes, and shall be approved by Classification Society.
- 7.3 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.

7.4 Transmitters

- 7.4.1 Each hydraulic supply header and each hydraulic actuator supply line of the X-mas tree valves shall have a pressure transmitter. The transmitter on the actuator supply lines shall be used for indirect indication of the position of the valve.
- 7.4.2 Pressure transmitters shall be in accordance with I-ET-3010.00-1200-800-P4X-013 - GENERAL CRITERIA FOR INSTRUMENTATION AND CONTROL PROJECTS. Also, the following additional requirements shall be met:

Pressure connection:	1/2" NPT (F)
Overpressure:	200% the operation range
Operating range:	0 to 12,000 psi
Calibrated range:	1,000 to 10,000 psi
Zero and span adjust:	YES

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7.4.3 The transmitters shall be installed in a manifold with multiple block and bleed valves.

7.5 Directional Valves

7.5.1 The solenoid valves used for the actuation of Christmas Tree Valves shall be 3 (three) way, two positions, piloted operated, fail-safe type, open when energized, with a return spring, according to the type, model and supplier previously qualified by PETROBRAS. Individual power of each solenoid from pilot-operated DCVs shall be less or equal to 3.5W

7.5.2 The diagram of valves shall be in accordance with I-DE-3010.1M-1210-888-P4X-002 - PRODUCTION WELL CONTROL RACK - FUNCTIONAL DIAGRAM.

7.5.3 The manifold blocks for solenoid valves shall have integrated block valves, as well as 2 (two) hydraulic supply headers with 6 mm internal diameter. One at hydraulic pressure level HPR10K or HPR5K for SCSSV and VHIF-I, and the other at hydraulic pressure LEVEL LPR for others Xmas Trees valves, each with 3/8" NPT socket connection. The manifold shall also have 2 (two) internal return headers with 10 mm internal diameter, for the same levels of pressure as the above, but with 1/2" NPT female connection.

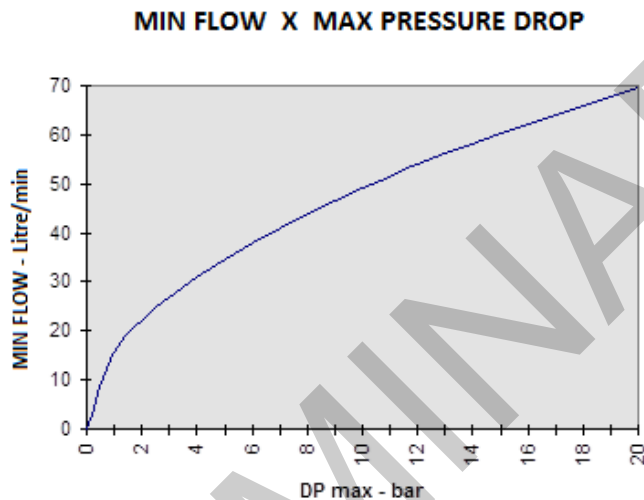
7.5.4 The valve hydraulic pilots shall be supplied by an independent header fitted with an accumulator and a flow restrictor, so that it doesn't get affected by a pressure drop at the valve main body when the valve opens.

7.5.5 In case of wells with Christmas Trees deployed by cable, hydraulic directional valves used for VHIF-I command shall be 3 (three) positions (depressurized central position) and 4 (four) ways, manual actuation and locked in position, as presented in I-DE-3010.1M-1210-888-P4X-002 - PRODUCTION WELL CONTROL RACK - FUNCTIONAL DIAGRAM to WCT deployed by cable. These directional valves are in fail-as-is.

7.5.6 Directional Valves shall have at least the following characteristics:

- Solenoid actuator with operational voltage of 24V \pm 25%;
- Maximum power consumption of 3.5W;
- Working Pressure of 1,000psi to 5,000psi or 3,000psi to 10,000psi. Working pressure will be defined during Detailing Engineering Design
- Shutdown pressure: 800 psi (alignment to valve return in case of pressure loss);
- Connection: adequate for assembly on manifold (6mm accesses);
- Internal Accesses: 6mm (minimum);
- If is not possible to determinate the exact internal passage section, the valve shall be in accordance with the minimum flow x maximum pressure drop curve below;
- Pilot hydraulic supply shall be independent from hydraulic power supply;
- Directional Valve sealing shall be adequate to operation fluid;

- Directional Valve body material shall be AISI 316;
- Solenoids: epoxy box, temperature class F, minimum protection degree IP-56 (adequate for saline ambient) and adequate to operate on environmental conditions established on item 3 (including hazardous area classification);
- Assembly type: manifold – minimum number of 6 valves per manifold;
- Adequate to operate with a water-glycol based hydraulic fluid (as described on this document) which may contain up to 20% on volume of sea water filtered in 10 micron abs.



7.5.7 Directional Valves minimum required performance during service life:

- Maximum flow in closed position: 0.1 cm³/min;
- Maximum return flow with valve open: 0.0 cm³/min;
- Maximum flow when valve transitioning from closed to open position: 0.1cm³/min;
- Valve Electro mechanic maximum response time: 1s;
- Maximum operation current (Transient): 1A;
- Holding current at 24Vdc: 150mA;
- Maximum Holding current: 300mA;
- Minimum operation cycles without failure or sealing alteration: 5000;
- Minimum energized hours without solenoid failure: 43800;
- Service life time: 25 years;
- Valve's construction materials shall not present potential reactivity that could lead to galvanic corrosion;
- Valve shall be capable of endure sea water contamination up to 20% on volume between 4°C and 45°C;
- Valve's construction materials shall not allow the development of bacteria on fluid;

7.6 Pressure switches

- 7.6.1 Each Rack hydraulic return line from Production Well Control Rack to the HPU shall have high pressure switches, which shall be adjustable from 300 to 5,000psi.
- 7.6.2 The above listed pressure switches shall have hermetically sealed contacts, SPDT, 1 A type at 24 Vdc. The contact shall normally work closed, opening in abnormal operation conditions.
- 7.6.3 The pressure switches shall have IP-56 encapsulation protection level, appropriate for operations in the conditions established in item 3.
- 7.6.4 All parts in contact with the fluid shall be made of AISI-316 stainless steel.

7.7 Pressure Gauges (Manometers)

- 7.7.1 Each line to actuate the WCT's valves and SCSSV or of the manifold mode of operation shall have a pressure gauge in accordance with I-ET-3010.00-1200-800-P4X-013 - GENERAL CRITERIA FOR INSTRUMENTATION AND CONTROL PROJECTS. Also, the following additional requirements shall be met:

Connection:	top 1/2" NPT (M)
Pulsation damper:	Required
Glycerin filled:	Required
Double scale in kPa and psi:	0 - 7,000 psig for the WCT's valves 0 - 12,000 psig for the SCSSV and VHIF-I
Back rupture disk:	Required

7.8 Filter

- 7.8.1 One filter shall be foreseen on each of hydraulic fluid supply lines inlet, with the following characteristics, in accordance to ISO 16889:

Body:	AISI-316
Filtering element:	AISI-316
Mesh:	3 micra abs ($\beta \geq 200$)
Connections:	3/8" NPT socket
Differential pressure indicator:	Required
Operation pressure:	as in item 3.5

8 IDENTIFICATION

- 8.1 All connections and instruments shall be clearly identified.
- 8.2 The identification plates shall be made of AISI 316 with lettering in low relief fixed by stainless steel screws.
- 8.3 The rack shall be clearly and permanently identified on its front part with a 200 x 75 mm plate with the following inscriptions respectively:

<p style="text-align: center;">PN-1210008 RACK DE CONTROLE DE POÇOS DE PRODUÇÃO P-XX</p>

- 8.4 The manifold blocks corresponding to each well shall be equally identified with plates indicating the well number.

9 DOCUMENTATION

- 9.1 Complete documentation of the Production Well Control Rack, covering all devices and services, shall be supplied with the proposal, for approval, and for final acceptance.
- 9.2 There shall be supplied with the proposal, at least the following technical documents:
- Technical specifications comprising: equipment, accessories, panel and materials;
 - Data-sheets and brochures for each equipment;
 - All equipment and installation data including: material list, equipment list, spare part list, power consumption, weight, panel lay-out, etc;
 - Complete description of services, tests, etc.
- 9.3 There shall be supplied for approval, in the number of copies defined at PETROBRAS documents, at least the following technical documents:
- Technical specifications comprising: equipment, instrument, accessories, cables, tubing and materials;
 - Data-sheets and drawings for the panel and each instrument;
 - Installation drawings including general arrangement, electrical diagrams, hydraulic diagrams, wiring diagrams, cable/tubing list, material list, equipment list;
 - Test procedures;
 - Certificate of materials etc.
 - Manifold Drawings
- 9.4 Complete Production Well Control Rack certified documentation shall be provided in digital media (USB flash drive) and in as many copies as requested by PETROBRAS documents.



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10 ACCEPTANCE TESTS

- 10.1 It shall be submitted to PETROBRAS, for approval, detailed FAT, SAT and SIT programs 60 (sixty) days in advance.
- 10.2 All tests shall be according to IEC 62381.
- 10.3 In order to shorten the time at the tests on board, the documentation shall be checked at platform office.
- 10.4 There shall also be provided all functional tests regarding operational and safety aspect, as detailed at the Tests Program approved by PETROBRAS.
- 10.5 The following tests shall be performed at FAT prior to delivery:
- Visual inspection;
 - Tightness/leakage;
 - Functional Test,/ Loop test;
 - Electric Isolation;
 - Cleanliness class of hydraulic fluid;
 - Calibration, configuration and diagnostic of each field instrument;
- 10.6 After the installation of the equipment on board, at least, the following tests shall be repeated (SAT):
- Visual inspection;
 - Tightness/leakage;
 - Functional Test;
 - Loop test;
 - Electric Isolation;
- 10.7 For Site Integration Tests (SIT) all the tests performed during FAT shall be repeated.
- 10.8 SIT shall be executed with the Production Well Control Rack interconnected with the Hydraulic Power Unit.