
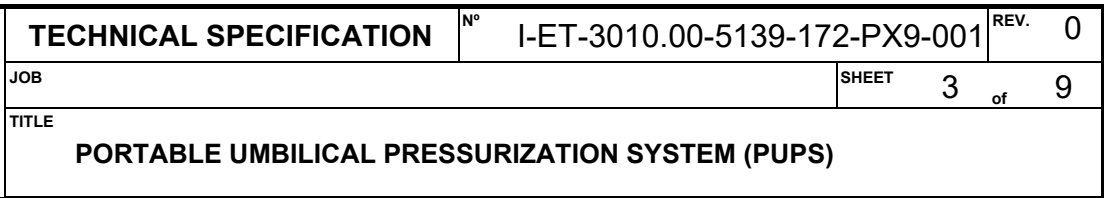

 <b>PETROBRAS</b>	<b>TECHNICAL SPECIFICATION</b>				Nº I-ET-3010.00-5139-172-PX9-001				
	CLIENT PETROBRAS				SHEET 1 of 9				
	JOB								
	AREA								
SUB	TITLE				<b>PORTABLE UMBILICAL PRESSURIZATION SYSTEM (PUPS)</b> <b>INTERNAL</b> SUB/ES/EDA/EAI				
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- [1] API 6A - Specification for Wellhead and Christmas Tree Equipment
- [2] API 17E – Specification for Subsea Umbilicals
- [3] API 17F - Standard for Subsea Production Control Systems
- [4] API 17Q - Recommended Practice on Subsea Equipment Qualification
- [5] ASME B16.5:2013 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service
- [6] ASME B16.5:2013 - Pipe Flanges and Flanged Fittings
- [7] IEC 60079 (latest revision) - Series Explosive Atmosphere Standards
- [8] IEC 60092 (latest revision) - Electrical installations in ships - ALL PARTS
- [9] IEC 60529 (latest revision) - Degrees of Protection Provided by Enclosures (IP Code)
- [10] IEC 61892-6 (latest revision) - Mobile and fixed offshore units – Electrical installations – Part 6: Installation
- [11] DNV-RP-H103 - Modelling and Analysis of Marine Operations

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[12] ISO 13628-6:2006 - (**Note:** The cleaning classification for hydraulic fluids of the old NAS 1638 standard ("Cleanliness Requirements used in Hydraulic Systems") is cited in this specification as a reference best known by the industry. The most current standard is SAE AS 4059 ("Cleanliness Classification for Hydraulic Fluids"));

**3.2 PETROBRAS Technical Specifications**

[13] I-ET-3010.00-1200-800-P4X-015 - REQUIREMENTS FOR TUBING AND FITTING (ALIGNED TO IOGP-JIP33 S-716)

[14] I-ET-3000.00-1519-29B-PZ9-012 - TOPSIDE ARRANGEMENT AND INTERFACES WITH SUBSEA UMBILICAL SYSTEMS

[15] I-ET-3010.00-1300-279-PX9-002 - DIVERLESS BELL MOUTH (BSDL) - GENERAL REQUIREMENTS (*if applicable*)

[16] I-ET-3010.00-1300-279-PX9-001 - UNIFIED DIVERLESS SUPPORT TUBE (TSUDL) - GENERAL REQUIREMENTS (*if applicable*)

**3.3 PETROBRAS Additional Documents**

[17] I-LI-3010.00-1300-279-PPC-350 - BSDL-SI PART LIST (*if applicable*)

[18] I-LI-3010.00-1300-270-P56-001 - Unified Diverless Support Tube Part List (*if applicable*)

**4 DEFINITIONS**

FPU CONTRACTOR/SELLER	The entity that is responsible for the Engineering, Procurement, and Construction of the Floating Production Unit (FPU), as established in the contract of the FPU
SUPPLIER	Company hired by FPU CONTRACTOR/SELLER, to supply components from PUPS.
MAY	It is used when alternatives are equally acceptable
SHOULD	It is used when a provision is not mandatory, but is recommended as a good practice
SHALL	It is used when a provision is mandatory
AVAILABILITY	Probability that the system will remain operating under the conditions specified in the project during its useful life.
EQUIPMENT	Set of components and parts composing an architecture to meet the requirements of this ET.

**5 TECHNICAL CHARACTERISTICS**

**5.1 Design and fabrication**

**5.1.1** All subsea monitoring components shall be designed in accordance with [2] and [3].

**5.1.2** All enclosures and equipment to be placed in hazardous areas shall comply and be certificated according to [7].

**5.1.3** All enclosures with a required degree of ingress protection shall comply with [9].

**5.1.4** All electrical cabling specifications and installations shall comply with [8] and [10].

## 6 GENERAL TECHNICAL REQUIREMENTS

### 6.1 System overview

**6.1.1** PUPS is a topside portable device to safely pressurize the header hydraulic power supply line of the Local Panels from RSMS, from any pressure supply similar to subsea HPU. PUPS unit is illustrated on Figure 1:



Figure 1: PUPS Overview Design.

**6.1.2** PUPS shall allow safe pressurization of all Local Control Panels.

**6.1.3** PUPS shall mainly be used as hydraulic power supply for the riser supports control system (BSDL and/or TSUDL) during dry dock/shipyard commissioning activities and for offshore pull in/out activities controlling the hydraulic actuators from BSDL/TSUDL units.

**6.1.4** A simplified block diagram reflecting only the hydraulic connections is shown on Figure 2. The block diagram containing all the expected connections, including hydraulic, electrical and optical are presented on [15], [16] and specific MD.

**6.1.5** If PUPS is foreseen in other project's documents, the above items shall be included as additional requirements.

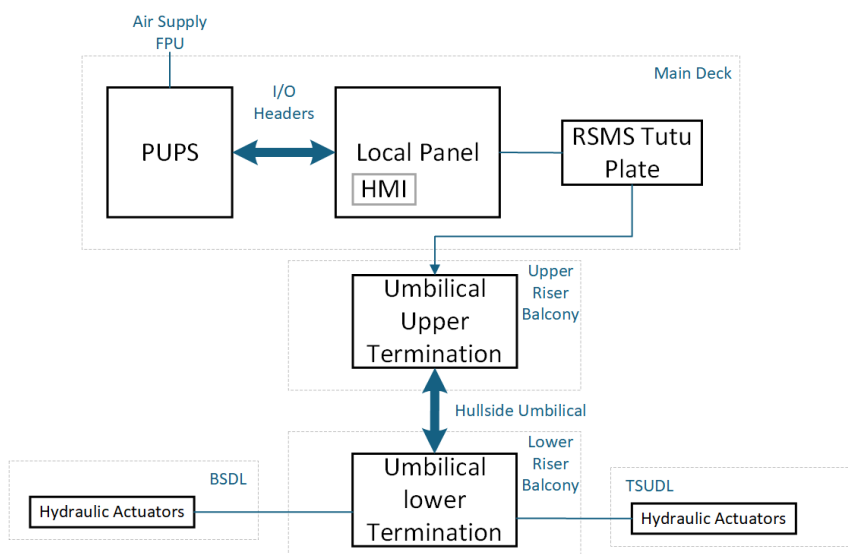



Figure 2: Connections Between PUPS and Hydraulic circuits.

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## 6.2 Topside Infrastructure

- 6.2.1 FPU CONTRACTOR/SELLER shall provide 2 PUPS units as part of the design/supply.
- 6.2.2 PUPS shall be in the same deck level of Local Panels and shall be located close to them.
- 6.2.3 PUPS shall be designed in accordance with its corresponding area classification where it will be operated.
- 6.2.4 PUPS shall be supplied with 5 OFF 10m ½" hydraulic hoses (Local Control Panels hydraulic supply) and 2 OFF 10m ¾" air hoses (topside air supply).
- 6.2.5 PUPS shall have two specific inlets (main and redundant) to be used for topside air supply.
- 6.2.6 PUPS shall have five specific inlet/outlets to be used for BSDL-SI/TSUDL actuation (Local Control Panels hydraulic supply).
- 6.2.7 FPU CONTRACTOR/SELLER shall provide 5 hydraulic supply header for all local panels connected to PUPS units as illustrated on Figure 3.
- 6.2.8 PUPS Topside Infrastructure shall consist into 2 units connecting their hydraulic inlets/outlets into five hydraulic supply headers. Figure 3 illustrates the general concept of the design.

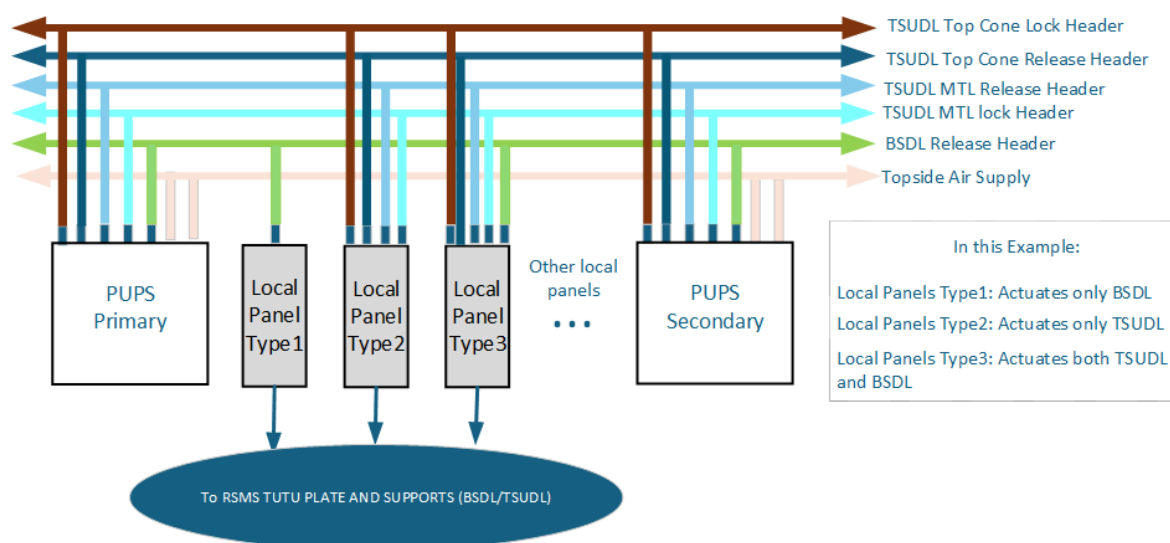



Figure 3: PUPS Topside Infrastructure example.

- 6.2.9 FPU CONTRACTOR/SELLER shall design this architecture and full submit to PETROBRAS for review and approval before starting the manufacture.

## 6.3 Hydraulic requirements

- 6.3.1 PUPS shall be used for control line pressurization only, with water-based control fluids with cleanliness class according to Norm ISO 4406 CLASS 17/15/12. (Equivalent to class 6 from the old Norm NAS1638 Cleanliness Requirements used in Hydraulic Systems). The following water-glycol based hydraulic fluids are allowed:
- Castrol Transaqua HT (Compatible with Castrol Transaqua DW)
  - MacDermid Oceanic ECF (Compatible with MacDermid HW443 & HW525P)

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6.3.2 All PUPS hydraulic components shall have full compatibility with all the water-glycol based hydraulic control fluids listed in item 6.3.1.

6.3.3 PUPS hydraulic circuit shall be supplied filled with the compatible hydraulic fluid defined for Subsea HPU during FPSO detailing phase.

6.4 Internal Components

6.4.1 PUPS unit will comprise two main functions: Provide Hydraulic supply to the local panels for BSDL/TSUDL actuation (as a portable HPU) and control the TSUDL/BSDL actuators by using a set of directional valves. A general concept of the PUPS design is illustrated on Figure 4. A more detailed design is presented on the specific MD.

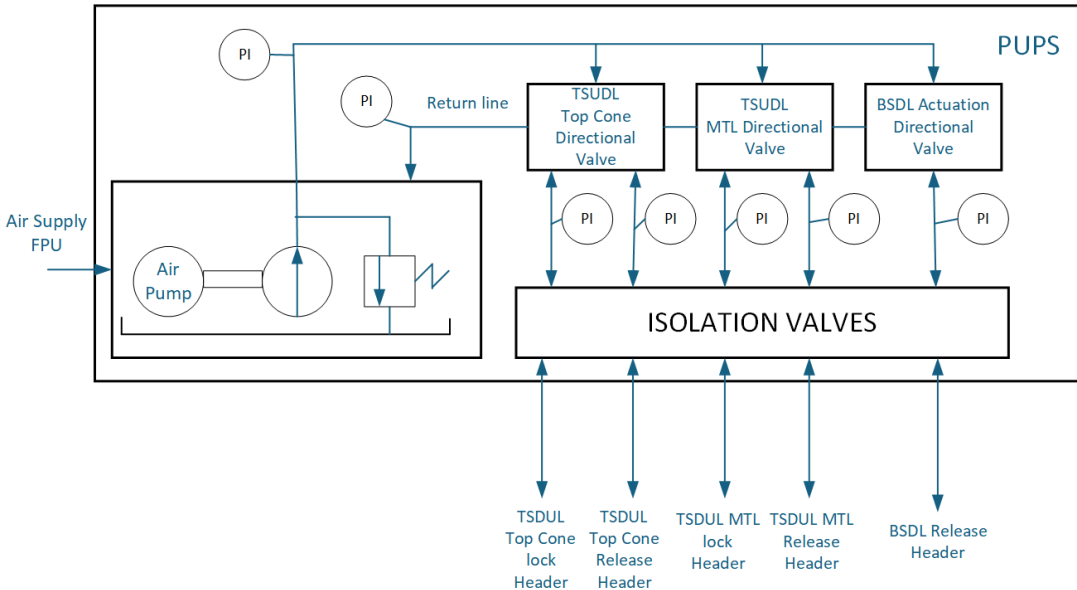


Figure 4: PUPS internal components general concept.

6.4.2 PUPS shall include inside components to guarantee a safety and controlled hydraulic operation (i.e. pressure indicators, hydraulic valves, PSVs for hydraulic lines & air lines, hydraulic accumulators, etc).


6.4.3 Hydraulic control line shall be regulated to operate from 0 to 7500 psi, using a hydraulic air pump solution with manual-operated pressure regulators.

6.4.4 PUPS shall include inside components to guarantee control fluid cleanliness to be maintained as per mentioned class in item 6.3.1 (i.e. hydraulic filters) and air supply filtering.

6.4.5 PUPS shall include inside a hydraulic reservoir (with a level indication) for storing control fluid used for hydraulic actuation and as a return tank from local panels. PUPS shall include a reservoir drain.

6.4.6 The return tank shall have minimum volume of 200L.

6.4.7 PUPS shall have all internal tubings, fittings and supports made of super austenitic stainless steel (SS alloy with 6% molybdenum) with at least ½" O.D., that complies with DNV RP B401. All fitting sealings type shall comply with medium pressure standard as defined in the ref [14]. Allowable working pressures shall be calculated according to ASME B31.3.

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6.4.8 PUPS units shall have a drain port designed at the return tank for water glycol fluid replacement.

6.4.9 FPU CONTRACTOR/SELLER shall provide means to adjust hydraulic pressure actuation on each control (for example by using needle valves), if required by pull-in operational team.

6.4.10 Each line of the PUPS shall have its own pressure indicator and clear identification to show that all lines are within their expected ranges for the operation.

6.4.11 Each inlet/outlet of the PUPS shall have a manual operated isolation valve for safety and control purposes as demonstrated on Figure 4.

6.4.12 Directional valves for BSDL/TSUDL actuation shall be manual operated. More details of the valves can be found in the specific MD.

6.4.13 Each drain and outlet port, as well as each manometer shall have their own isolating valve.

6.4.14 The drain/bleed ports shall be used also to take fluid sampling when necessary.

6.4.15 Fluid sampling shall be collect considering a valve positioned just after a filter to confirm cleanliness requirements.

6.4.16 PUPS shall have TAG indications of all internal components for maintenance purposes.

6.5 Operational Requirements

6.5.1 PUPS shall be designed with heavy duty caster wheels with brakes.

6.5.2 PUPS operation location shall be with easy access for operators and with all air supply facilities required to operate. PUPS location and header infrastructure shall be presented in a 3D model and submitted to PETROBRAS for review and approval.

6.5.3 PUPS shall have TAG indications for all the main operational components.

7 INSTALLATION AND COMMISSIONING REQUIREMENTS

7.1 The requirements presented in this section shall be met regarding commissioning activities. Planning of installation and commissioning activities shall be developed and submitted for PETROBRAS approval.

7.2 Commissioning is understood, in this context, as the process of placing the system (or parts thereof related to a particular monitored structure) in a fully functional state, without any pending issues.

7.3 All equipment shall be tested onshore during dry dock phase, before deployment at sea. Testing and interventions on equipment shall not be planned or performed during offshore deployment (on deck), save for emergency occasions, in which case approval shall be explicitly given by PETROBRAS.

7.4 In terms of Acceptance Test, the FPU CONTRACTOR/SELLER shall evidence, at least:

- Actuation of PUPS header circuits;
- Manometer reading;
- Valves Test;
- Flushing and Cleanliness Certificates;
- Sealing Test and no leakage evidence.



