# TECHNICAL SPECIFICATION

- **Nº:** I-ET-3010.00-5520-800-P4X-001
- **CLIENT:** SUP
- **JOB:** REFERENCE BASIC DESIGN
- **AREA:** BÚZIOS
- **TITLE:** SUPERVISION AND OPERATION SYSTEM (SOS) SCREENS
- **MICROSOFT WORD / V. 2013 / I-ET-3010.00-5520-800-P4X-001_0.DOC**

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Approval: PEDRO

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SUMMARY

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1. INTRODUCTION

This Technical Specification establishes the guidelines that shall be followed for the design of the Supervision and Operation System (SOS) of the PRESALT Floating, Production, Storage and Offloading units, to be installed at Offshore Field, Brazil.

2. OBJECTIVE

The objective of this system is to allow the operator, from a workstation, to execute the major functions needed to process supervising and operation. In accordance with the fact that it is a graphic computational tool, the workstation used must have interaction with the user by a high-resolution monitor, keyboard and indication device (mouse or track-ball).

3. ABBREVIATIONS

- CCTV - Closed Circuit Television System;
- CSS - Control and Safety System;
- EEMUA - Engineering Equipment and Materials Users Association;
- ESD - Emergency Shutdown;
- FPSO - Floating, Production, Storage and Offloading;
- FGS - Fire and Gas System;
- HDS - Historical Data Server;
- HMI - Human Machine Interface;
- IEC - International Electrotechnical Commission;
- PCS - Process Control System;
- PLC - Programmable Logic Controller;
- PSD - Process Shutdown System;
- RTDS - Real Time Data Server;
- SOS - Supervision and Operation System;
- VAC - Ventilation and Air-conditioning.

SHALL  The word “Shall” is to be understood as mandatory.

SHOULD  The word “Should” is to be understood as strongly recommended to comply with the requirements.
4. REFERENCE DOCUMENTS

4.1. INTERNATIONAL STANDARDS

- EEMUA n. 191 – Alarms Systems – A guide to Design, Management and Procurement;

4.2. PROJECT DOCUMENTS

- I-ET-3010.00-1200-800-P4X-002 – AUTOMATION, CONTROL AND INSTRUMENTATION ON PACKAGED UNITS;
- I-ET-3010.00-5520-861-P4X-002 - SUPERVISION AND OPERATION SYSTEM - SOS

5. OVERVIEW

Topsides SOS is a hardware/software system whose purpose is to display field information in a suitable format, supporting plant operation and troubleshooting, while data gathering is performed by Topsides CSS or Package. In general, these systems feature field interfacing capabilities, not only for data acquisition, but also to command and control final actuating devices.

Topsides SOS HMIs allow the operation and supervision of the offshore production unit from the Central Control Room.

6. FUNCTIONS

The minimum functions implemented on the Supervision and Operation System are listed below:

- Process variable values display in real-time;
- Generation of the process variables tendency graphs;
- Alarm warning through message issuing, object color dynamics, or sound alarms;
- Alarm acknowledgment;
- Equipment operational status signaling (on, off, failure and maintenance);
- Starting up and shutting down equipment and failure detection (when applicable);
- Putting the equipment in failure status and in maintenance conditions when applicable;
- Manual activation of the ESD (emergency shutdown) and firefighting (deluge valves included);
• Opening and closure of valves;
• Opening and closure of electric devices;
• Change the operating parameters: bypass the input points, override the output points controllers and totalizer instrument parameter setting;
• Event log;
• Process variables, alarms and events historical recording;
• On-line storage, recovery and changing on equipment data;
• Recovery and log of equipment operation time meters, failure and maintenance of equipment;
• Report issuing.

7. SCREENS AND WINDOWS

7.1. GENERAL DEFINITIONS

The system shall be structured in a series of screens and windows. The screens shall use all available space of the monitor display, while a window shall use only a portion of this space, being exhibited overlapping the screen. Screens and windows shall be composed by objects, which will represent the different available data on the system. Screens and windows shall be classified in accordance with the type of data represented on them. Thus, there shall be screens and windows for:

Screens:

• Process;
• Utilities;
• Safety;
• Vessel;
• Ventilation and air-conditioning (VAC);
• Cause and effect matrixes;
• Electric system;
• Summary (oil, gas and utilities);
• Package units;
• Maintenance;
• Diagnostics;

Windows:
• Instrument parameters set-up and control Loop;
• Safety/VAC;
• Commands to equipment.

There shall be three types of visualization for the alarm data: the alarm window (screen header), the alarm summary and alarm and events history.

The screens can also be classified by their hierarchical type into general and specific screens.

A set of screens and windows hierarchically organized has been defined for each type of data to be displayed. Each one of these sets is still subject to a general type screen called Initial Screen. Figure 1 shows the hierarchy.
**TECHNICAL SPECIFICATION**

**Nº** I-ET-3010.00-5520-800-P4X-001

**REV.** 0

**AREA:** BÚZIOS

**SHEET 7 of 55**

**TITLE:** SUPERVISION AND OPERATION SYSTEM (SOS) SCREENS

**NP-1**

**ESUP**

### Initial Screen (Inicial_1 / Inicial_2)

- Diagnostics Screens
- State of Platform
- Oil Processing Overview
  - Oil Processing Screens
- Gas Processing Overview
  - Gas Processing Screens
- Water Process Overview
  - Water Processing Screens
- Utilities Overview
  - Utilities System Screens
- Safety Overview
  - Safety Zone View
  - Fire Detectors Screens
  - Gas Detectors Screens
- Electrical System Screens
- Naval Overview
- Ballast and Mooring System Screens
- Cause & Effects Matrices

**Figure 1 – Hierarchy**

**Note:**

1. All colors along this document will be called by name. The names have the respective RGB code color detailed in “Appendix A – Table Colors”, located at the end of the document;

2. The background color of all screens shall be *Silver Gray*.

3. Some screens can have slightly different background color to indicate different process trains (train membranes, for example). The use of "watermarks" will also be admitted to indicate different process trains (TGs or compressors, for example). These
backgrounds and watermarks colors shall be always in tones very close to the default background color.

**7.2. GENERAL ESTRUCTURE**

All screens shall have the same general structure composed of 4 parts:

1. **Alarm window** - 110 x 12 (aspect ratio) / 1320 x 150 (pixels), at the left top;
2. **Paging buttons** - 50 x 12 (aspect ratio) / 600 x 150 (pixels), at the right top;
3. **Screen area of monitoring and operation** - 160 x 74 (aspect ratio) / 1920 x 880 (pixels), immediately below Screen Header, occupying the whole width;
4. **Bottom bar** - 160 x 4 (aspect ratio) / 1920 x 50 (pixels), at the bottom of the screen occupying the entire width.

Note: Total Screen Resolution = 160 x 90 (aspect ratio) / 1920 x 1080 (pixels).

**7.2.1. Alarm Window**

The alarm window shall be composed of an alarm message list at the left side, and two action buttons at the right side with the following functions:

1. **✓** Acknowledge the selected alarm and silence the horn of alarm group which the alarm is contained in (an alarm is selected with a simple left-click on its row). While there is no selected alarm this button remains "inactive" in *Smoke Gray* color.

2. **✓** Silence the horn of alarm group which the selected alarm is contained in, without the acknowledgment of the alarm. While there is no selected alarm this button remains "inactive" in *Smoke Gray* color.

The alarm messages shall be composed of the fields presented below:

- a) Date;
- b) Time;
- c) State;
- d) Priority;
- e) Group;
f) Name;

  g) Description.

The color of the alarm messages will depend on the alarm priority, and shall be in accordance with the standard established in item 7.13. At least 5 rows of alarms shall be displayed on Alarm Window.

New alarms shall appear at the top of alarm list, respecting the following classification order:

1. Unacknowledged alarms;
2. Most critical alarms;
3. Latest alarms.

Through each row of alarm shall be possible opening its specific process screen with a double left-click on its message.

7.2.2. Paging Buttons

The screen paging among the system screens shall be done through paging buttons, located at the right top of all screens.

The paging buttons shall be segregated in 4 (four) columns and grouped as follows, beginning at the left top.

The background color of the paging buttons shall be Light Gray, and its texts shall be in Night Black color.
1° Column

- State of platform

This paging button shall be presented with the original text "Estado da plataforma" (state of platform). When selected, this object executes a paging command to platform status announcing screen. It shall also present the current platform status, as well as alarm announcing, as follows:

In case of shutdown, the state of platform paging button shall present the highest ESD level detected and the tag and description of the first initiator event that cause the shutdown.

The signalization is made setting the text color to *Light Gray* and blinking the background to *Night Black* color, when unacknowledged. After acknowledged, if the ESD persists, the background color will remain *Night Black* without blink.

When ESD condition is extinguished, the background color of the button turns back to *Light Gray* and text color turns back to *Night Black*.

![State of Platform paging button](image)

- Cause and effect

The cause and effect paging button executes a paging command to the cause and effect matrix from the current screen. If the current screen does not have a matrix, this button will be disabled and the text color will be in *Smoke Gray* color.

2° Column – FPSO’ Safety and Integrity

- Safety

This paging button opens the safety overview screen of the FPSO.

This paging button opens the naval overview screen of the FPSO.

- Automation
This paging button opens the automation overview screen of the FPSO.

3° Column – Maintenance Coordination Area

- VAC
  This paging button opens the VAC overview screen of the FPSO.
- Electric system
  This paging button opens the general one-line diagram screen of the FPSO.
- Utilities
  This paging button opens the utilities overview screen of the FPSO.

4° Column – Production Coordination Area

- Oil processing
  This paging button opens the oil processing overview screen of the FPSO.
- Gas processing
  This paging button opens the gas processing overview screen of the FPSO.
- Water processing
  This paging button opens the water processing overview screen of the FPSO.

These objects shall also have alarm color dynamic, except cause & effect matrix paging button, as described in item 7.13.

7.2.3. Bottom Bar

The Bottom Bar shall be design according Figure 5. Its components are presented below.

1. Button with unit’s number/name (in this example, P-66)

   This button shall open a suspend menu with a general screen list, where will be possible to execute paging commands to the following screens:
   - Initial screen;
   - Fire detectors general view;
   - Gas detectors general view;
• AFDS detectors general view;
• Instruments general view;

2. Tool bar composed of buttons with the following functions:

2.1. Show/Hide all tags and values display with engineering units of the instruments or equipment on the active specifics screens. Only retain the static equipment tags visible;

2.2. Paging command to information window where shall be displayed the number of instrument’s data sheets and reference drawings, with version, of all instruments/equipment contained in the active specifics screens;

2.3. Paging command to alarm summary screen, item Erro! Fonte de referência não encontrada. of this document;

2.4. Paging command to alarms and events history screen, item 7.13 of this document;

2.5. Paging command to reports screen, 7.13 of this document;

2.6. Paging command to trends screen;

2.7. Paging command to maintenance screen;

2.8. Print screen;

3. Paging bar composed of buttons with the following functions:

3.1. Backwards history paging;

3.2. Forwards history paging;

3.3. Paging command to the previous screen in the process flow;

3.4. Paging command to the subsequent screen in the process flow;
3.5. Paging command to previous screen according with the screens’ hierarchy;

3.6. Paging command to subsequent screen according with the screens’ hierarchy;

3.7. Swap screens between monitors;

4. Information Bar composed of the following items:

4.1. Communication status with servers;

4.2. User logged on, and user access profile;

4.3. Date and Time;

5. Button with Petrobras’ logo

This button shall open a menu with administrative functions, according to the user access profile, for example: log in/ log off, switch user, etc.

HMI software version information shall be presented on this menu.

The background color of bottom bar shall be Smoke Gray.

7.3. INITIAL SCREEN

The Initial Screen shall be composed of paging buttons that will allow paging to the specifics screens.

The paging buttons shall be segregated in 5 (five) groups: Process, Non-Electrical Utilities, Electrical system, Safety and Vessel.
The colors of paging buttons shall indicate the specific screen type, according to:

<table>
<thead>
<tr>
<th>Specific Screen</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process and Non-Electrical Utilities</td>
<td>Regular Brown</td>
</tr>
<tr>
<td>Safety</td>
<td>Blue Ocean</td>
</tr>
<tr>
<td>Electrical system</td>
<td>Light Gray</td>
</tr>
<tr>
<td>Vessel</td>
<td>Lime Green</td>
</tr>
</tbody>
</table>

Table 1; its text shall be in black color.

<table>
<thead>
<tr>
<th>Specific Screen</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process and Non-Electrical Utilities</td>
<td>Regular Brown</td>
</tr>
<tr>
<td>Safety</td>
<td>Blue Ocean</td>
</tr>
<tr>
<td>Electrical system</td>
<td>Light Gray</td>
</tr>
<tr>
<td>Vessel</td>
<td>Lime Green</td>
</tr>
</tbody>
</table>

Table 1 - Initial Screen Buttons’ Colors

If the number of paging buttons described above does not fit in a unique screen, the Initial Screen shall be split into two - primary and secondary - with sequential paging button between the two screens. The Primary Initial Screen shall contain the set of paging buttons corresponding to the Process and Non-Electrical Utilities, and Safety Screens. The Secondary
one shall contain the paging buttons corresponding to the Safety and Electrical System Screens.

The paging buttons shall also have alarm summary dynamic as described in item Erro! Fonte de referência não encontrada..

7.4. PLATFORM STATUS SCREEN

The platform status screen shall be composed of four objects with text in black color indicating the emergency shutdown levels (ESD-4, ESD-3T, ESD-3P, ESD-2). The background color of the objects shall be Light Gray and its border shall be in Night Black color.

These objects do not generate commands, they only implement the alarm warning function by color change, as follows:

- In case of shutdown (ESD), the corresponding ESD rectangle shall present the initiator of the shutdown. It will remain blinking with Night Black background and text in Light Gray color until its acknowledgment;
- In case of acknowledged ESD, the corresponding ESD rectangle will remain with fixed Night Black background, and text in Light Gray color;

Below each object shall be represented all conditions that generate the ESD.

The fire detectors shall be represented by the letter “F”, gas detectors shall be represented by the gas type, CH4, CO2, H2 or H2S. The detectors shall be grouped by zones.

All others conditions shall be represented by its respective tag.

The alarm annunciation shall be done through a rectangle around the condition, as described in item Erro! Fonte de referência não encontrada..

A gray button with text “REARMAR PLATAFORMA” in black” color shall execute the command to disable the stop status after all ESD causes are normalized; in other words, it will reset the “shutdown”. Another gray button with text “SILENCIAR ALARME GERAL” in black color shall execute the command to silence the general alarm.

The Figure shows the layout of the platform status screen.
7.5. PROCESS AND UTILITIES GENERAL FLOW SCREENS

The General Flow Screen shall be segregated into systems, each one of them concerning one of its stages or functions.

Each system shall be represented by one object which indicates the equipment which best describes it.

The main values of the process variables shall be displayed in real time with their engineering units.

The system alarm summary shall be represented by a rectangle around each system that shall be visible only when an alarm is active, with the same dynamic described in item Erro! Fonte de referência não encontrada..

When a system is selected the paging command to the specific screen which shows the corresponding system in detail shall be executed.

There are six types of general flow screens:

- Oil Production;
- Water Production;
- Gas Production;
• Water Injection;
• Gas Injection;
• Fiscal Measurement.

They present an overview of these flows with their principal valves, instruments and equipments and respective alarms. When the operators left click over the subsystem, the screen of respective instrument/equipment will be loaded.

![Diagram](image)

**Figure 8 – Water Production Screen**

### 7.6. PROCESS AND UTILITIES SPECIFIC SCREENS

The main aim in the development process of the screens is to provide a better and safer operation. Therefore, it shall be designed and constructed to allow the operator identify quickly an abnormal process, where the deviation is and its magnitude.

The Specific Screens shall not represent the flow diagram, and shall avoid display irrelevant information.

On a standard operating the analog values, engineering units, and instrument tags will not be showed on the Specific Screens.

The display of these information will be done, at any time, for the whole screen, through the Bottom Bar, as described in item 7.2.3, or individually, through the Command Windows, as described in item 7.2.3.
As a guideline, the entire system shall be represented, at most, by five screens.

The display of level variables in real time will be done in instant numeric value and percentage scale.

The display of the remaining variables will be done in instant numeric value and with their engineering units.

All Specific Screen shall present a title indicating the process area or the utilities system represented at its left top, in black text.

As a general rule, the most important information should be arranged in the left top, central, and right bottom of the screen, following the instinctive trajectory of the scanning on search actions. As shown in Figure 9 below.

![Figure 9 - Instinctive Trajectory of the Scanning on Screen](image)

Screens with electric pumps representation shall not have the corresponding electric motors symbology. These pumps representation shall have a paging command to the corresponding electrical system screen, as well as, these one shall have a paging command to return for the production or utilities screens.

Auxiliary information, such as tables, situation general plants (top view of the Platform safety screens, for example), selection buttons, and bar graphs of support variables shall be placed in the left bottom of the screen (outside area of first scan; Figure 10).
The specific screens shall have the minimum necessary information to allow operation of equipment or system, the grouping of equipment should be avoided.

The line drawing should show the fluid flow / power, whenever possible, from left to right and from top to bottom. At each change of direction, an arrow should be used to indicate the direction of flow before the vertex.

Figure 10 - Outside Area of First Scan

7.6.1. Command Windows

Each command window shall have only one valve or equipment. Its position must be adjustable.

The command windows shall be composed of tabs, described below.

Note: All windows and tabs for all valve types and provided equipment shall be submitted for TGBV approval.

7.6.1.1. Operation Tab

The operation tab shall have at least the following information: status (on / off, open / closed etc.), maintenance, acted override, present lock (trip), mode (manual, location etc.), present fail, extracted, in test, protection tripped.

1. Valve or equipment status: a text within a rectangle shall be displayed according de following table:

<table>
<thead>
<tr>
<th>Status</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opened</td>
<td>Aberta</td>
</tr>
<tr>
<td>Closed</td>
<td>Fechada</td>
</tr>
<tr>
<td>On</td>
<td>Operando</td>
</tr>
<tr>
<td>Off</td>
<td>Parado</td>
</tr>
<tr>
<td>Failure</td>
<td>Em Falha</td>
</tr>
</tbody>
</table>

2. Valve or equipment open/close or start/stop commands; There shall be a unique button displayed.

3. Maintenance override status: a text within a rectangle shall be displayed according de following table:

<table>
<thead>
<tr>
<th>Status</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. Maintenance override commands.

5. Local or remote operation status a text within a rectangle shall be displayed according to the following table:

<table>
<thead>
<tr>
<th>Operation</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>Local</td>
</tr>
<tr>
<td>Remote</td>
<td>Remota</td>
</tr>
</tbody>
</table>

Figure 11 shows the layout of the operation tab.

7.6.1.2. Maintenance Tab

The maintenance tab shall have at least the following information: valve/ equipment states and outputs (command) and physical inputs (feedback), showing the logical value (0 or 1), specification of the present fail (ZS lack, ZS overlay, no signal [below 4mA or above 20mA] fault on the I / O card [failure kind] etc.), the analog inputs value in mA (position transmitters and gas detectors).

Figure 12 shows the layout of the maintenance tab.
7.6.1.3. Trend Tab

On trend tab shall be displayed the main variables trends related with the equipment.

This tab shall be available only for equipment.

7.7. SAFETY GENERAL VIEW SCREEN

On Safety General View Screen shall be represented the left side outline of the platform with identification of the different elevations and their corresponding safety areas separately. Each one of levels shall be represented by a different object with alarm summary function. The identification of the levels shall be written in black color, indicating also the number of the corresponding safety area.

Also shall be represented the top outline of the platform with the identification of the modules. Each module shall be represented by a different object with alarm summary dynamic as described in item 7.13.7. The identification of the modules shall be written in black color.

The paging command to the safety specific screen shall be done through the top outline of the platform, selecting the respective module.
7.8. SAFETY SPECIFIC SCREENS

On Safety Specific Screens shall be represented all elevations' top view of a module, allowing the identification of the different Safety Zones separately.

The localization of its respective safety devices shall be represented, including: fire sensors, gas sensor, manual fire alarms (AMIs), flow switches, fan and air-conditioning units, dampers, door switches. Also shall be presented start and stop push buttons of fans and air-conditioning units.

The activation and confirmation of the CO2 trigger shall be represented on Detailed Safety Windows.

If the representations of all modules with its respective devices do not fit in one safety specific screen shall be created a detailed safety windows for each zone. On safety specific screen only will be represented the zones by a different object for each one with alarm summary dynamic as described in item Erro! Fonte de referência não encontrada.. A feature to indicate how many detail safety windows there are in each module shall be provided in order to grant to the operator the use of the navigation buttons. For example, after screen title put in parentheses (n of m).
The paging command to a safety window shall be done through the Safety Specific Screens, selecting the respective Safety Zone.

The screen title shall indicate the platform module and the generic safety zone tag of the represented area.

The position and the identification of the respective CCTV' cameras shall be displayed on safety specific screens.

At left bottom of the safety specific screens shall be displayed the left side outline or the top outline of the platform, in a reduce scale. On these outlines shall be indicated the localization of the module, in Dark Gray, without alarm summary function.

Ship directions shall be representend in safety specific screens (top, bottom and sides) as following:

- Bow – PROA;
- Stem – POPA;
- Portside – BB;
- Starboard – BE;

The fire detectors shall be represented by the letter “F” within a rectangle, gas detectors shall be represented by the gas type, CH4, CO2, H2 or H2S, and the manual fire alarms shall be represented by the abbreviation “AMI”.

A dashed line shall link the path detectors.

The alarm annunciation shall be done through a rectangle around the representation of the detector or AMI, as described in item 7.13.

The corresponding operation window shall be displayed when a detector representation is selected.
7.8.1. Detectors’ Operation Window

The operation windows shall be composed of tabs, described below.

7.8.1.1. Operation Tab

The Operation Tab shall have the following elements:

1. Read numeric value, i.e. %LEL for fuel gas, ppm for toxic gas, mA for fire. Gas detectors shall also have the read numeric value, i.e. mA displayed.

2. Set points

All set points shall be displayed within a rectangle, and will not be adjustable through the operation tab.

3. Maintenance override status: a text within a rectangle shall be displayed according the following table:

<table>
<thead>
<tr>
<th>Maintenance Override</th>
<th>Operational Override</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Actuated</td>
<td>Not Actuated</td>
<td>Não Atuado</td>
</tr>
<tr>
<td>Actuated</td>
<td>Not Actuated</td>
<td>OM Atuado</td>
</tr>
</tbody>
</table>

4. Maintenance Override command.

Figure 15 shows the layout of the detectors’ operation tab.
7.8.1.2. Maintenance Tab

1. Failures Status

On maintenance tab shall be explicit the failures status, a text shall be displayed according to the following table:

<table>
<thead>
<tr>
<th>Failure</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O module</td>
<td>Módulo em Falha</td>
</tr>
<tr>
<td>Chanel</td>
<td>Falha de Monitoração de Linha</td>
</tr>
<tr>
<td>Out of range</td>
<td>Instrument Fora da Faixa</td>
</tr>
</tbody>
</table>

Figure 16 shows the layout of the detectors’ maintenance tab.

7.9. VAC GENERAL VIEW SCREEN

On VAC General View Screen shall be represented the VAC flow. Each safety zone will be represented by a rectangle with black text and Snow Gray background with alarm summary function.

The selection of each safety zone executes the paging command to the corresponding Safety Window.

The Equipment that assist more than one safety zone shall be represented.
7.10. CAUSE AND EFFECT MATRIX SCREENS

On Cause and Effect Matrix screen shall be represented all physical and virtual switch contained in the interlocking logical.

The Cause and Effect Matrix is a representation of the actions taken due to the abnormal events detected, as foreseen on the safety interlocking system. The matrix rows indicate the events in terms of the sensors which define the events by its actuation. The columns indicate the actions executed in terms of the equipment to be actuated.

The screen title shall indicate the equipment, system or process area for which the Cause and Effect matrix is intended.

The background color of the matrix shall be *Snow Gray*.

The rows shall be composed by the fields presented below:

1. Description: provides a description of the event represented by the sensor actuation in black text.

The color dynamic of the description field’s background shall be according with the physical status of the sensor, independently of overrides, as following:
2. Sensor’s tag

The tag shall be written in black color. The color dynamic of background of the Sensor’s tag field shall be according with the physical status of the sensor, independently of overrides, as following:

<table>
<thead>
<tr>
<th>Physical Status</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Snow Gray</td>
</tr>
<tr>
<td>Actuated</td>
<td>Soft Pink</td>
</tr>
</tbody>
</table>

3. Override Status

The dynamic of the override status field shall be according with the physical status, Operational and Maintenance overrides, as following:

<table>
<thead>
<tr>
<th>Physical Status</th>
<th>Maintenance Override</th>
<th>Operational Override</th>
<th>Text</th>
<th>Background Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Actuated</td>
<td>Not Actuated</td>
<td>Not Actuated</td>
<td>Blank field</td>
<td>Snow Gray</td>
</tr>
<tr>
<td>Actuated</td>
<td>Not Actuated</td>
<td>Not Actuated</td>
<td>Blank field</td>
<td>Soft Pink</td>
</tr>
<tr>
<td>-</td>
<td>Actuated</td>
<td>Not Actuated</td>
<td>OM Atuado</td>
<td>Blue Oster</td>
</tr>
<tr>
<td>-</td>
<td>Not Actuated</td>
<td>Actuated</td>
<td>OM e OO Atuados</td>
<td>Blue Oster</td>
</tr>
<tr>
<td>-</td>
<td>Actuated</td>
<td>Actuated</td>
<td>OM e OO Atuados</td>
<td>Blue Oster</td>
</tr>
</tbody>
</table>

4. Time remaining of the operational override.

The time remaining of the operational override shall be displayed when the operational override is actuated.

The dynamic of this field shall be according with the physical status, Operational and Maintenance overrides, as following:

<table>
<thead>
<tr>
<th>Physical Status</th>
<th>Maintenance Override</th>
<th>Operational Override</th>
<th>Background Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Actuated</td>
<td>Not Actuated</td>
<td>Not Actuated</td>
<td>Snow Gray</td>
</tr>
<tr>
<td>Actuated</td>
<td>Not Actuated</td>
<td>Not Actuated</td>
<td>Soft Pink</td>
</tr>
<tr>
<td>-</td>
<td>Actuated</td>
<td>Not Actuated</td>
<td>Blue Oster</td>
</tr>
<tr>
<td>-</td>
<td>Not Actuated</td>
<td>Actuated</td>
<td>Blue Oster</td>
</tr>
<tr>
<td>-</td>
<td>Actuated</td>
<td>Actuated</td>
<td>Blue Oster</td>
</tr>
</tbody>
</table>
5. Row x Column intersection: if there is no correspondence between the cause (row) and effect (column) the intersection shall always show the background color *Snow Gray*. Whenever there is a correspondence, the background color shall indicate that the command to execute the corresponding action is being issued. The colors displayed by the object are presented on the table below:

<table>
<thead>
<tr>
<th>Physical Status</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Actuated or Overridden</td>
<td>Silver Gray</td>
</tr>
<tr>
<td>Actuated</td>
<td>Soft Pink</td>
</tr>
</tbody>
</table>

6. Area description - indicates the process or utility area where the sensor is installed. The selection of this object shall execute a paging command for the corresponding specific screen. The text shall be in black, corresponding of process/utility screen title. The columns shall be composed by the fields presented below:

7. Equipment’s tag

The tag shall be written in black color. The color dynamic of background of the Equipment’s tag field shall be according with the interlocking logic resulted, independently of overrides, as following:

<table>
<thead>
<tr>
<th>Physical Status</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Snow Gray</td>
</tr>
<tr>
<td>Actuated</td>
<td>Soft Pink</td>
</tr>
</tbody>
</table>

The equipment usually is: ADV, SDV and BDV actuators, LV, PV and XV valves, pumps and package units.

8. Maintenance Override Status

The dynamic of the maintenance status field shall be according with the interlocking logic resulted and maintenance overrides to open or close / turn on or turn off, as following:

<table>
<thead>
<tr>
<th>Interlocking logic resulted</th>
<th>Maintenance Override Open/Turn On</th>
<th>Maintenance Override Close/Turn Off</th>
<th>Text</th>
<th>Background Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Actuated</td>
<td>Not Actuated</td>
<td>Not Actuated</td>
<td>Blank field</td>
<td>Snow Gray</td>
</tr>
<tr>
<td>Actuated</td>
<td>Not Actuated</td>
<td>Not Actuated</td>
<td>Blank field</td>
<td>Soft Pink</td>
</tr>
<tr>
<td>-</td>
<td>Actuated</td>
<td>Not Actuated</td>
<td>OM Abrir /OM Ligar</td>
<td>Blue Oster</td>
</tr>
<tr>
<td>-</td>
<td>Not Actuated</td>
<td>Actuated</td>
<td>OM Fechar /OM Desligar</td>
<td>Blue Oster</td>
</tr>
</tbody>
</table>
9. Effect

The dynamic of effect field shall be according the effect of the output over the valve or equipment.

The text shall be a verb written in black color ("abrir"-open, "fechar"-close, "ligar"-startup, "desligar"-turn-off) indicating the command to be executed. After the execution of the command, the text shall be an adjective ("aberta"-open, "fechada"-closed, "ligada"-turned on, "desligada"-turned off, "falha" - valve and equipment failure, according the real status of the equipment.

The color dynamic of the effect field back ground shall be according the table below:

<table>
<thead>
<tr>
<th>Interlocking logic resulted</th>
<th>Maintenance Override Open/Turn On</th>
<th>Failure Status</th>
<th>Background Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Actuated</td>
<td>Not Actuated</td>
<td>Off</td>
<td>Snow Gray</td>
</tr>
<tr>
<td>Actuated</td>
<td>Not Actuated</td>
<td>Off</td>
<td>Soft Pink</td>
</tr>
<tr>
<td></td>
<td>Actuated</td>
<td>Off</td>
<td>Blue Oster</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On</td>
<td>Light Yellow</td>
</tr>
</tbody>
</table>

The process/utility matrix screens shall be grouped by effect.

The fire & gas and VAC cause and effect matrix shall be grouped by cause.

Scroll bars could be created, in case of the amount of lines and/or columns exceed the size of the screens.

There shall be cause & effect matrix and VAC screens for the package units whenever necessary. However the availability of the overrides commands depends on the manufacturers.

Note: Rows of different processes shall be separated with a thicker line.
7.11. DETECTOR SCREENS

7.11.1. Gas Detectors Screens

On gas detectors screens shall be presented one or more tables containing a list of the gas detectors grouped by safety zone, with the layout showed in Figure 19:

<table>
<thead>
<tr>
<th>ZONA M1-101</th>
</tr>
</thead>
<tbody>
<tr>
<td>AST-M081</td>
</tr>
<tr>
<td>AST-M082</td>
</tr>
<tr>
<td>AST-M083</td>
</tr>
<tr>
<td>AST-M084</td>
</tr>
<tr>
<td>AST-M085</td>
</tr>
<tr>
<td>AST-M086</td>
</tr>
</tbody>
</table>

Where:

- 1° Column - Detector’s tag (omitting the zone).
- 2° Column - Gas Type

The alarms annunciation related to the gas detectors shall be done through a rectangle around of the gas type with the same dynamic described in item 7.13.

- 3° Column - Maintenance Override Status
The maintenance override status shall be indicated with the same dynamic presented on cause and effect matrix screen).

- 4° Column - Read numeric value, i.e. %LEL for Fuel Gas and ppm for Toxic Gas.

The corresponding operational window shall be displayed when the row is selected.

### 7.11.2. Fire Detectors Screens

On fire detectors screens shall be presented one or more tables containing a list of the fire detectors grouped by safety zone, with the layout showed in Figure 20:

<table>
<thead>
<tr>
<th>ZONA M1-101</th>
</tr>
</thead>
<tbody>
<tr>
<td>UST-M001</td>
</tr>
<tr>
<td>UST-M002</td>
</tr>
<tr>
<td>UST-M003</td>
</tr>
<tr>
<td>UST-M004</td>
</tr>
<tr>
<td>UST-M005</td>
</tr>
<tr>
<td>UST-M006</td>
</tr>
</tbody>
</table>

Where:

- 1° Column – Detector’s tag (omitting the zone).
- 2° Column – Sensor type.

The alarms annunciation related to the fire detectors shall be done through a rectangle around of the sensor type with the same dynamic described in item 7.13.

- 3° Column - Maintenance Override Status

The maintenance override status shall be indicated with the same dynamic presented on cause and effect matrix screen).

- 4° Column - Read numeric value, i.e. mA.

The corresponding operational window shall be displayed when the row is selected.

### 7.12. INSTRUMENTS WINDOWS
7.12.1. Operation Windows

The operation windows shall be composed of tabs, described below.

7.12.1.1. Operation Tab

The operation tab shall have the following elements:

1. Set points
   All set points shall be displayed within a rectangle. Only control set points will be adjustable through the operation tab.

2. Instrument’s range;

3. Maintenance and Override status: a text within a rectangle shall be displayed according to the following table:

<table>
<thead>
<tr>
<th>Maintenance Override</th>
<th>Operational Override</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Actuated</td>
<td>Not Actuated</td>
<td>Não Atuado</td>
</tr>
<tr>
<td>Actuated</td>
<td>Not Actuated</td>
<td>OM Atuado</td>
</tr>
<tr>
<td>Not Actuated</td>
<td>Actuated</td>
<td>OO Atuado</td>
</tr>
<tr>
<td>Actuated</td>
<td>Actuated</td>
<td>OM e OO Atuados</td>
</tr>
</tbody>
</table>

4. Maintenance Override commands

Figure 21 shows the layout of the instrument’s operation tab.

7.12.1.2. Sparkline Tab

On sparklines tab shall be displayed the main variables sparklines related with the equipment.
This tab shall be available only for equipment.

7.12.1.3. Maintenance Tab

1. Failures Status

On maintenance tab shall be explicit the failures status, a text shall be displayed according de following table:

<table>
<thead>
<tr>
<th>Failure</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O module</td>
<td>Módulo em Falha</td>
</tr>
<tr>
<td>Chanel</td>
<td>Falha de Monitoração de Linha</td>
</tr>
<tr>
<td>Out of range</td>
<td>Instrument Fora da Faixa</td>
</tr>
</tbody>
</table>

Figure 22 shows the layout of the instrument’s maintenance tab.

7.12.2. Control Loop Tuning Tab

The control loop tuning tab shall be composed of three sections: data inputs, graph and faceplate.

7.12.2.1. Data Inputs

Data inputs shall be on the left side of the window. The instruments parameters changes shall be made through selection of the rectangle containing the current value and entering the new value.

To change the controller mode, the corresponding mode button must be selected (automatic or manual).

The components that shall be available on data inputs are showed below.
For PID Controllers

- Valve opening (percentage). Obs.: This value shall correspond to the percentage of opening of the valve, and not the output sign at the controller;
- Set-point of the unit of process variable (percentage or engineering unit);
- Deadband;
- Maximum value of valve opening;
- Minimum value of valve opening;
- Proportional gain;
- Integral time;
- Derivative time;
- Automatic/Manual buttons for the controller of the instrument;

For Gas Flow Totalizers:

- Meter configuration data;
- Gas composition constants;
- Scale adjustments - instant flow, temperature and pressure (when applicable).

7.12.2.2. Graph Areas

Instrument’s tag and two scale graph, one with the engineering unit of the process variable, and the other in percentage (0 - 100%).

The graphic area shall be located on the right side of the window.

The components that shall be available on graphic area are showed below.

For PID Controllers:

- Process variable (PV);
- Set-point (SP);
- Expected aperture;
- Real position; in case is available.

All of them shall be displayed for the latest 120 seconds.

For Gas Flow Totalizers:
• Instant flow;
• Corrected instant flow;
• Temperature;
• Pressure.

All of them shall be displayed for the latest 120 seconds.

For Oil Flow Totalizers:
• Instant flow;
• Corrected instant flow.

All of them shall be displayed for the latest 120 seconds.

For Water Flow Totalizers:
Instant flow (It shall be displayed for the last 120 seconds).

7.12.2.3. Faceplate

The instruments’ faceplate is located in the middle of the window.

The components that shall be available on Faceplate are showed below.

For PID Controllers:
• Input variable numeric value and Engineering unit;
• Real position of valve in percentage, if available;
• DIRETA/INVERSA (direct/reverse) instrument action indication;

Note: In case of split-range valve configurations, valves percentage shall be indicated if available.

For Oil Flow Totalizers:
• Numeric value of instant flow and Engineering unit;
• Numeric value of totalized flow and Engineering unit;
• Numeric value of totalized flow in the latest production period (to be used in platform production bulletin, for 24 of production);
• Numeric value of partial totalized flow since the last balance;
• Partial totalized flow reset button;
• Flow totalizer time (hh:mm:ss);

• Synchronizing button between supervision workstations clocks and flow totalizers. This button copies workstations time to flow totalizers;

• Instant flow graph in 0-100% scale.

For Gas Flow Totalizers:

• Instant flow, temperature and pressure graphs, in 0-100% scale;

• Numeric value of instant flow, temperature and pressure;

• Orifice plate constant;

• Numeric value of totalized flow;

• Numeric value of totalized flow in the latest production period (to be used in platform production bulletin, for 24 hours of production);

• Numeric value of partial totalized flow since the last balance;

• Partial totalized flow reset button;

• Flow totalizer time (hh:mm:ss);

• Synchronizing button between supervision workstations clocks and flow totalizers. This button copies workstations time to flow totalizers.

Figure 23 shows the layout of the instrument's control loop tuning tab for PID controllers.
7.12.3. Electrical System Screens

On electrical system screens shall be displayed the one-line diagrams representation (low, medium and high voltage).

The color of the bars shall be according the voltage level, as the table below presents.

<table>
<thead>
<tr>
<th>Voltage Level</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low voltage (&lt;1kV)</td>
<td>Normal Purple</td>
</tr>
<tr>
<td>Medium, high voltage (&gt;1kV)</td>
<td>Dark Purple</td>
</tr>
<tr>
<td>Deenergized bus bar</td>
<td>Smoke Gray</td>
</tr>
</tbody>
</table>

Electric screens, buses and equipment’s with dynamic state (typically breakers), shall be represented as follows:

Circuit breakers are represented by a small rectangle with the dynamics described below:

- Closed state representation: filled symbol, with the color corresponding to the respective voltage level;
- Open state representation leaked symbol, outline in black;
- Drawer in test position representation: put the letter "T" in bold, black color, within the symbol, on the representation of open / closed
- External trip representation (external shutdown): open state representation with the text "Sd" in bold black color inside
- Drawer extracted actuated representation: open state representation, with the letter "E" in their bold;
- Circuit breaker "NOT ready for operation" representation: open state representation with a "!” (exclamation point) in bold inside - this sign of "not ready for operation" is usually a extracted drawer summary or in testing position or protection (internal) actuated, the ready to operate representation is actually the open or closed state;
- Information unavailable representation (communication loss, for example): open state representation with the text “?” in bold black color inside;
- Circuit breaker (drawer) exists, but no indication is provided in the project (is not a lack of information): symbol filled in dark gray - parse: improve representation to avoid confusion with "screen discolored" by the alarm presence;
Any of these states is also considered an alarm (thus defined by analysis of their criticality rules as Alarm Management) will be represented by rectangle around equipment in the alarm color.

When there, commands (open / close) will not be represented directly on screen, will be accessed via its command window, as described above in respect of Item Command Window.

Where applicable, the operating modes (manual, local, in override, faulting etc.) will be represented similarly to that described for general equipment.

Note: Electric equipment which is commanded through the process specific screens shall not be commanded through electric system screens.

7.12.4. Automation

These screens shall be called through the paging button, located at the right top of all screens. Besides displaying PLC’s state, they shall also have other screens to display PLC’s architecture with information about communication status between the systems and their remote terminal units.

For each PLC cluster, or package unit, there shall be, at least, the following set of information signals:

- Master PLC active;
- PLC A communications available;
- PLC B communications available;
- Remote terminal units communication status;
- Failure in each remote terminal unit;
- Low battery;
- CPU Forcing;
- E/S Forcing;
- E/S failure;
- Rack or CPU failure.

7.12.5. Reports

These screens are to be called through the bottom bar, item 7.2.3 of this document.
Reports shall be automatically generated and recorded on disk, so as to allow historical recovery.

These reports can be printed or displayed in a special screen of any supervision workstation. All the above mentioned facilities will be performed through specific buttons, one for each function.

Reports headers shall contain, at least, the report name, date and time of issuance.

7.12.5.1. Instrument Bypass Report

This report shall show tables with a list of all bypassed instruments. This report shall be displayed as in the following example:

<table>
<thead>
<tr>
<th>&lt;Instrument tag&gt;</th>
<th>&lt;Instrument tag&gt;</th>
<th>&lt;Instrument tag&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

This report shall be generated when solicited (and not automatically), and shall display the bypassed instruments at the time it was generated.

7.12.5.2. Override Report

This report shall show tables with a list of all overridden instruments, independently of the type of override. This report shall be displayed as in the following example:

<table>
<thead>
<tr>
<th>&lt;Instrument tag&gt;</th>
<th>&lt;Instrument tag&gt;</th>
<th>&lt;Instrument&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

This report is to be generated when requested, and shall display the status of override points at the time it was generated.
Note: The report types, their contents and formats shall be confirmed / defined by TGBV at a specific meeting.

7.12.5.3. Utilities Report

A table with the following information shall be submitted:

- Level and/or volume of diesel oil in stock;
- Level and/or volume of drinking water in stock;
- Amount of chemical products (units to be defined) – one for each product.

7.13. ALARMS AND EVENTS TREATMENT

7.13.1. Alarm Summary Screen

The Alarm Summary Screen shall present a list of active alarms, acknowledged or not, with at least the following fields: date, hour, name, alarm description, and alarm group and subgroup which the alarm belong.

The following functions shall be implemented on Alarm Summary:

- Alarm warning through messages;
- Alarm acknowledgement: individually, by group, by subgroup, and by priority;
- Ordering: by chronological order, priority, tag, and per group;
- Scroll Alarm list;
Notes:
- The text color that makes up a line of alarm is described in item 7.13;
- The Alarm Summary shall allow visualization of the alarm groups defined in this document;
- The fields contained in each alarm message shall be defined by TGBV together with ALTUS in particular meeting.

7.13.2. Alarms and Events History Screen

The Alarm and Events History Screen shall present a list of active alarms, acknowledged or not, and events with at least the following fields: name, date, hour, and description of alarm or event.

The following functions shall be implemented on Alarm and Events History:
- Alarm warning and event announcing through messages;
- Ordering: chronological order, priority, by tag, and per group;
- Scroll alarm and event list;

Notes:
- The text color that makes up a line of alarm is described in item 7.13;
Daily files shall be generated, in disk, for later recovery;

The fields contained in each alarm message shall be defined by TGBV together with ALTUS in particular meeting.

7.13.3. Alarm Groups

The alarms shall be classified into groups and subgroups, allowing its visualization and acknowledgement by the responsible operator.

The alarm groups and subgroups are arranged as the structure below:

- Segurança (Fire and Gas system alarms)
- Naval (Vessel alarms)
- Diagnóstico (Diagnostic alarms)
- COMAN (Maintenance Coordination Area)
  - VAC (VAC alarms)
  - Elétrica (Electrical system alarms)
  - Facilidades (Utilities alarms)
- COPROD (Production coordination area alarms)
  - Produção Óleo (Oil processing alarms)
  - Produção Gás (Gas processing alarms)
- Produção Água (Water processing alarms)

Besides the operational groups mentioned above, it shall also be possible to classify the alarms by ESD2 initiators and ESD3 initiators.

The supervision workstations shall be configured in order to allow each station to alarm the desired groups. The Segurança group (Fire and Gas system alarms) shall be alarmed in all workstations.

7.13.4. Priorities

The alarms are classified by priority, as a function of their criticality, and it shall be classified in three levels: high, medium, and low.

Alarm is a warning to the operator that an action with limited time to be performed it is necessary.
All information that does not require actions by the operators shall be considered an event.

No equipment status shall be considered an alarm, except if a command is not performed on demand.

Each area involved (expertise areas), shall classify the alarms considering specific aspects, as detailed below.

**High Priority Alarms**

All alarms associated to high intensity disturbances that represent high risk to the installations shall be included in this category.

EEMUA 191 suggests that high priority alarms do not exceed 5% of the total alarms present on the installation.

**Medium Priority Alarms**

In this category, shall be fit all alarms related to medium intensity disturbance for operation.

EEMUA 191 suggests that medium priority alarms do not exceed 15% of the total alarms present on the installation.

**Low Priority Alarms**

All alarms considered of low priority or low critical importance shall be included in this group.

Note: The limits described for alarms quantity within each priority (criticality) are recommended and not mandatory.

### 7.13.5. Alarm Warning

The system shall announce the alarms in three forms: alarm messages, object color dynamics and/or sound alarms.

#### 7.13.5.1. Alarm Messages

The messages shall pop on the alarm window, in the alarm summary screen and in the alarm and event history screen. The text in these messages shall proceed accordingly with the function of priority of the alarm with the following colors:

**High priority alarms:**

- Not acknowledged: blinking red;
- Acknowledged: red.
Medium priority alarms:
- Not acknowledged: blinking orange;
- Acknowledged: orange.

Low priority alarms:
- Not acknowledged: blinking yellow;
- Acknowledged: yellow.

Events:
- White.

Note: the blinking colors shall have lighter hue for background (light red, light orange, light yellow).

7.13.6. Instrument or Equipment Alarm Dynamic

The alarm annunciation shall be done through rectangular outline around of the graphic instrument or equipment representations.

In case of an occurrence of an alarm, the rectangle shall present the following dynamic:

<table>
<thead>
<tr>
<th>Status</th>
<th>Dynamic</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Background color</td>
<td>Silver Gray</td>
</tr>
<tr>
<td>High priority alarms</td>
<td>Not Acknowledge: Blinking Red</td>
<td>Red Hot</td>
</tr>
<tr>
<td></td>
<td>Acknowledge: Red</td>
<td></td>
</tr>
<tr>
<td>Medium priority alarms</td>
<td>Not Acknowledge: Blinking Orange</td>
<td>Citric Orange</td>
</tr>
<tr>
<td></td>
<td>Acknowledge: Orange</td>
<td></td>
</tr>
<tr>
<td>Low priority alarms:</td>
<td>Not Acknowledge: Blinking Yellow</td>
<td>Live Yellow</td>
</tr>
<tr>
<td></td>
<td>Acknowledge: Yellow</td>
<td></td>
</tr>
</tbody>
</table>

Alarms related with the same instrument or equipment that have the same priority shall be represented through the same rectangular outline.

Note: When the alarm is overridden, the color of the rectangular outline shall be according to the real state of the switch, without blink.

7.13.7. Alarm Summary Dynamic

The color dynamics for alarm annunciation in objects with alarm summary dynamics shall be the same as the highest priority alarm (criticality) present on summary, according table below:
The indication of the object that shall have the alarm summary dynamic is described in the contents of each screen.

7.13.8. Sound Alarms
The COMAN, COPROD, Segurança, and Naval groups shall generate in 4 different alarm sounds (horns with adjustable tones), in order to guarantee quick identification of the alarm origin.

7.14. SIMBOLOGY

7.14.1. Lines Representation

7.14.1.1. Lines Types
Three types of lines shall be represented: process, secondary and instrumentation. They shall be identified by their thickness (weight).

<table>
<thead>
<tr>
<th>Line Type</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process/Utilities</td>
<td>1.00</td>
</tr>
<tr>
<td>Secondary</td>
<td>0.50</td>
</tr>
<tr>
<td>Instrumentation</td>
<td>0.25</td>
</tr>
</tbody>
</table>

7.14.1.2. Lines Crossing
Lines crossing shall follow the criteria below:

- Lines of different thickness: the thickest line is continuous and the least thick line is interrupted;
- Lines with the same thickness: the horizontal line is continuous and the vertical line is interrupted.
7.14.1.3. Lines Colors

The fluid driven by the line is identified by the line color, in accordance with the table below:

<table>
<thead>
<tr>
<th>Fluid</th>
<th>R</th>
<th>G</th>
<th>B</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilge Water Oily, Open Drain, Grey Water (kitchen, shower, sink,</td>
<td>183</td>
<td>168</td>
<td>147</td>
<td></td>
</tr>
<tr>
<td>laundry, etc.), Black Water (sewage)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sea Water (Ballast, Bilge)</td>
<td>153</td>
<td>171</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>Fresh Water (Potable Water, Industrial Water, Water Injection)</td>
<td>143</td>
<td>186</td>
<td>181</td>
<td></td>
</tr>
<tr>
<td>Diesel Fuel, Aviation Kerosene</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cargo System, Hydrocarbon Liquid, Oil, Closed Drain, Condensate</td>
<td>153</td>
<td>153</td>
<td>153</td>
<td></td>
</tr>
<tr>
<td>Fuel Gas, Process Gas</td>
<td>221</td>
<td>222</td>
<td>165</td>
<td></td>
</tr>
<tr>
<td>Inert Gas, Nitrogen</td>
<td>188</td>
<td>156</td>
<td>197</td>
<td></td>
</tr>
<tr>
<td>Compressed Air</td>
<td>136</td>
<td>179</td>
<td>213</td>
<td></td>
</tr>
<tr>
<td>Chemical Products, Glycol, Lubricating Oil, Hydraulic Fluid</td>
<td>228</td>
<td>204</td>
<td>167</td>
<td></td>
</tr>
<tr>
<td>Deluge Water, Foam, Carbon Dioxide</td>
<td>200</td>
<td>160</td>
<td>160</td>
<td></td>
</tr>
<tr>
<td>Air (VAC), Steam</td>
<td>201</td>
<td>224</td>
<td>224</td>
<td></td>
</tr>
<tr>
<td>Instrumentation (dotted line from process line to instruments and</td>
<td>132</td>
<td>132</td>
<td>132</td>
<td></td>
</tr>
<tr>
<td>from instruments to valves)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low voltage (&lt;1kV)</td>
<td>188</td>
<td>156</td>
<td>197</td>
<td></td>
</tr>
<tr>
<td>Medium, high voltage (&gt;1kV)</td>
<td>145</td>
<td>108</td>
<td>153</td>
<td></td>
</tr>
<tr>
<td>Deenergized bus bar (electrical panels)</td>
<td>132</td>
<td>132</td>
<td>132</td>
<td></td>
</tr>
</tbody>
</table>

Notes:

Feedback lines of control loops shall be dashed, the line color shall be *Smoke Gray*.

7.14.1.4. Arrows

Flow direction shall be indicated by arrows with the same color of the line. There shall be two types of arrows.
The hollow arrow indicates flow direction only, while the full one, when selected by the appropriate device, executes paging command to the subsequent screen in the process flow. The full arrow shall have the same color of the line, and the hollow arrow shall have the same color as the background with border in the same line color.

The indication of the flow sequence is complemented by a text which shows the name of the next system or the tag of the next equipment in the process flow. The text color shall be black.

7.14.2. Equipment

Equipment that has status information (valves, pumps, damper, etc.) shall be represented according the following dynamic:

a) Opened or running status: full symbol.

![Figure 25 - Full Symbol - Example](image)

Note: The symbol shall have the same color of the line.

b) Closed or stopped status: hollow symbol.

![Figure 26 - Hollow Symbol - Example](image)

Note: The border shall have the same color of the line.

c) Control valves (and other equipment with analog status variable): the position indication shall be made through a horizontal bar graph; full bar graph indicates 100% of opening, hollow symbol indicates 0% of opening. The filling direction of the bar graph shall be the same of the fluid flow.

![Figure 27 - Control Valve](image)

d) Alarm annunciation: the alarm shall be represented by a rectangle around the equipment. Its color shall be according the alarm dynamic established in item 7.13.

e) Maintenance override: above the equipment at the right side the letter “O” in black text shall be displayed to indicate override status.

f) Emergency shutdown status: above the equipment the exclamation mark (!) in black text shall be displayed to indicate emergency shutdown status.
g) Local or remote operation status: above the equipment at the left side the letter “L” in black bold text shall be displayed to indicate Local operation status.

h) Manual or automatic operation status: above the equipment at the left side the letter “M” in black bold text shall be displayed to indicate Manual operation status.

i) Failure status: above the equipment at the right side the letter “F” in black text shall be displayed to indicate failure status.

j) The corresponding command window shall be displayed when equipment’s representation is selected.

k) Packages

(1) Symbol without color dynamic.

<table>
<thead>
<tr>
<th>Color</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Background</td>
<td>Regular Gray</td>
</tr>
<tr>
<td>Border</td>
<td>Dark Gray</td>
</tr>
</tbody>
</table>

(2) Running status: the text “OPERANDO” within a rectangle.

<table>
<thead>
<tr>
<th>Color</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Border</td>
<td>Dark Gray</td>
</tr>
<tr>
<td>Background</td>
<td>Regular Gray</td>
</tr>
<tr>
<td>Text</td>
<td>Night Black</td>
</tr>
</tbody>
</table>

(3) Stopped status: the text “PARADO” within a rectangle.

<table>
<thead>
<tr>
<th>Color</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Border</td>
<td>Dark Gray</td>
</tr>
<tr>
<td>Background</td>
<td>Regular Gray</td>
</tr>
<tr>
<td>Text</td>
<td>Night Black</td>
</tr>
</tbody>
</table>

(4) Packages’ tag shall be in black color.

(5) Alarm

The alarms shall be represented for rectangles around the equipment. Its color shall be according the color dynamic established in item 7.13. The higher priority alarm shall be the external.

Alarms with the same priority shall be represented in the same rectangle.

The alarms’ tag shall be presented below the packages’ tag, with the following dynamic:

<table>
<thead>
<tr>
<th>Status</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Smoke Gray</td>
</tr>
<tr>
<td>Actued</td>
<td>Night Black</td>
</tr>
</tbody>
</table>
I) Equipment that does not have color dynamic shall be displayed with the following:

<table>
<thead>
<tr>
<th></th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background</td>
<td>Regular Gray</td>
</tr>
<tr>
<td>Border</td>
<td>Dark Gray</td>
</tr>
</tbody>
</table>

7.14.3. Instrumentation

Analog transmitters shall be represented as the figure below:

The corresponding operational window shall be displayed when transmitter’s representation is selected.

Analog transmitters of different systems (PCS and PSD for example) that monitoring the same variable shall be represented in a unique object and the command window shall be the same for these transmitters too.

The instruments’ failure status shall be represented by the letter “F” in black text at the right side of the cursor, as well as the maintenance or operational override status that shall be represented by the letter “O”.
Figure 30 - Instruments’ Failure and Override Status

Analog transmitters of different systems (PCS and PSD for example) that monitoring the same variable shall be represented in a unique object and the command window shall be the same for these transmitters too.

Flow totalizers representation in the process/utilities screens shall be displayed as follows:

Instrument tag shall contain only the sequential number of the instrument. The four digits corresponding to the specific area shall be displayed on the top of the screen with the screen title.

Example: LI-5134001 will be displayed as LI-001 on the screen “SISTEMA DE AR COMPRIMIDO (5134)”.

7.14.4. Rupture Disc (PSE)

Rupture disc has only open or closed status as table below.

<table>
<thead>
<tr>
<th>Rupture Disc Status</th>
<th>Fill color</th>
<th>External Border</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal (closed)</td>
<td>FULL (accoring fluid line table color)</td>
<td>None</td>
</tr>
<tr>
<td>Broken (open)</td>
<td>HOLLOW</td>
<td>None</td>
</tr>
</tbody>
</table>

7.14.5. Fire and Gas Detectors

Fire and gas detectors from safety screens must inform status from active detection and fail state as table below.
7.14.6. Pumps and Blowers

The status from equipment shall be represented according table below.

<table>
<thead>
<tr>
<th>Pump/Blower Status</th>
<th>Fill color</th>
<th>External Border</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTUATED</td>
<td>Soft pink</td>
<td>None</td>
</tr>
<tr>
<td>NORMAL</td>
<td>HOLLOW</td>
<td>None</td>
</tr>
<tr>
<td>FAIL (Unacknowledge)</td>
<td>-</td>
<td>Blink (priority color)</td>
</tr>
<tr>
<td>FAIL (Acknowledge)</td>
<td>-</td>
<td>Fixed (priority color)</td>
</tr>
<tr>
<td>ON</td>
<td>FULL (according fluid line table color)</td>
<td>None</td>
</tr>
<tr>
<td>OFF</td>
<td>HOLLOW</td>
<td>None</td>
</tr>
<tr>
<td>FAIL (Unacknowledge)</td>
<td>Blinking</td>
<td>Blink (priority color)</td>
</tr>
<tr>
<td>FAIL (Acknowledge)</td>
<td>Blinking</td>
<td>Fixed (priority color)</td>
</tr>
</tbody>
</table>

The line color of the object shall be always the same as fluid line color. Clicking over the pump or blower, the system shows a command window.

Besides, there are 08 additional flags inside the object area, there are:

- **O**: Indicate active override;
- **F**: Indicate active fail state;
- **!**: Indicate SLG different with SLO. (Will occur when active override is blocking the logic from PLC);
- **M**: Indicate manual operation mode;
- **A**: Indicate automatic operation mode;
- **L**: Indicate local operation mode;
- **PP**: Indicate equipment ready to start;
- **NP**: Indicate equipment not ready to start.

7.15. VALVES LIBRARY

This library describes the valves symbols to represent this kind of equipment. The valve types are described below.
7.15.1. XV, SDV AND BDV VALVES (SINGLE ACTION)

Two micro switches and 01 solenoid to open or close.

The status from this kind of valves shall be represented according table below.

<table>
<thead>
<tr>
<th>Single action valve status</th>
<th>Fill color</th>
<th>External Border</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not ZSH + Not ZSL (don’t care)</td>
<td>Blinking (according fluid line color)</td>
<td>None</td>
</tr>
<tr>
<td>OPEN</td>
<td>FULL (according fluid line color)</td>
<td>None</td>
</tr>
<tr>
<td>CLOSED</td>
<td>HOLLOW</td>
<td>None</td>
</tr>
<tr>
<td>FAIL (Unacknowledge)</td>
<td>Blinking</td>
<td>Blink ( priority color)</td>
</tr>
<tr>
<td>FAIL (Acknowledgement)</td>
<td>Blinking</td>
<td>Fixed (priority color)</td>
</tr>
</tbody>
</table>

The line color of the object shall be always the same as fluid line color. Clicking over the valve, the system shows a command window.

Besides, there are 05 additional flags inside the object area, there are:

O  Indicate active override;
F  Indicate active fail state;
A  Indicate automatic mode;
M  Indicate manual mode;
!  Indicate SLG different with SLO. (Will occur when active override is blocking the logic from PLC). Head valves are animated with ZSL and ZSH status switch only. The output from PLC is no longer considered in animation.
7.15.2. XV VALVES (DOUBLE ACTION)

Two micro switches and 02 solenoids.

The status from this kind of valves shall be represented according to the table below.

<table>
<thead>
<tr>
<th>Double action valve status</th>
<th>Fill color</th>
<th>External Border</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not ZSH + Not ZSL (don’t care)</td>
<td>Blinking (according fluid line color)</td>
<td>None</td>
</tr>
<tr>
<td>OPEN</td>
<td>FULL (according fluid line color)</td>
<td>None</td>
</tr>
<tr>
<td>CLOSED</td>
<td>HOLLOW</td>
<td>None</td>
</tr>
<tr>
<td>FAIL (Unacknowledge)</td>
<td>Blinking</td>
<td>Blink (priority color)</td>
</tr>
<tr>
<td>FAIL (Acknowledgement)</td>
<td>Blinking</td>
<td>Fixed (priority color)</td>
</tr>
</tbody>
</table>

The line color of the object shall be always the same as fluid line color. Clicking over the valve, the system shows a command window.

Besides, there are 05 additional flags inside the object area, there are:

O  Indicate active override;
F  Indicate active fail state;
A  Indicate automatic mode;
M  Indicate manual mode;
!  Indicate SLG different with SLO. (Will occur when active override is blocking the logic from PLC). Head valves are animated within ZSL and ZSH status switch only. The output from PLC is no longer considered in animation.

7.15.3. CHOKE VALVES

Valve with position indicator (ZIT) are represented with the same color as line color. The fill color of rectangle depends on the percentage opening of the valve. The filling direction of the bar graph shall be the same of the fluid flow.

Clicking over the valve, the system shows a command window.

In addition, there are 02 other flags inside the object area, there are:

O  Indicate active override;
F  Indicate active fail state.
7.15.4. **PID VALVES**

Control valves (PID valves) are represented with the same color as line color. The fill color of rectangle depends on the percentage opening of the valve. The filling direction of the bar graph shall be the same of the fluid flow.

Clicking over the PID valve, the system shows the PID command window. In Additional, there are 02 other flags inside the object area, there are:

**M** Indicate manual operation mode (when automatic this flag will be hidden);

**F** Indicate active fail state.

7.15.5. **HV VALVES**

The status from this kind of valves shall be represented according table below.

<table>
<thead>
<tr>
<th>HV valve status</th>
<th>Fill color</th>
<th>External Border</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not ZSH + Not ZSL (don’t care)</td>
<td>Blinking (according fluid line color)</td>
<td>None</td>
</tr>
<tr>
<td>OPEN</td>
<td>FULL (according fluid line color)</td>
<td>None</td>
</tr>
<tr>
<td>CLOSED</td>
<td>HOLLOW</td>
<td>None</td>
</tr>
<tr>
<td>FAIL (Unacknowledge)</td>
<td>Blinking</td>
<td>Blink (priority color)</td>
</tr>
<tr>
<td>FAIL (Acknowledgment)</td>
<td>Blinking</td>
<td>Fixed (priority color)</td>
</tr>
</tbody>
</table>

This is a manual valve, so doesn’t have output solenoid. Has a flag inside the object area, there is:

**F** Indicate active fail state.

7.15.6. **SOLENOID VALVES**

The status from this kind of valves shall be represented according table below, based on SLO area.

<table>
<thead>
<tr>
<th>Solenoid valve status</th>
<th>Fill color</th>
<th>External Border</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLO OUTPUT ON(1)</td>
<td>FULL (according fluid line color)</td>
<td>None</td>
</tr>
<tr>
<td>SLO OUTPUT OFF(0)</td>
<td>HOLLOW</td>
<td>None</td>
</tr>
</tbody>
</table>

Have 02 flags inside the object area, there is:

**O** Indicate active override;

! Indicate SLG different with SLO. (Will occur when active override is blocking the logic from PLC).
## 8. APPENDIX A – COLORTABLE

This table compiles all the color used into the system.

<table>
<thead>
<tr>
<th>Color Name</th>
<th>R</th>
<th>G</th>
<th>B</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNOW WHITE</td>
<td>255</td>
<td>255</td>
<td>255</td>
<td></td>
</tr>
<tr>
<td>SNOW GRAY</td>
<td>230</td>
<td>230</td>
<td>230</td>
<td></td>
</tr>
<tr>
<td>LIGHT GRAY</td>
<td>208</td>
<td>208</td>
<td>208</td>
<td></td>
</tr>
<tr>
<td>SILVER GRAY</td>
<td>192</td>
<td>192</td>
<td>192</td>
<td></td>
</tr>
<tr>
<td>REGULAR GRAY</td>
<td>180</td>
<td>180</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td>DARK GRAY</td>
<td>160</td>
<td>160</td>
<td>160</td>
<td></td>
</tr>
<tr>
<td>GRAPHITE GRAY</td>
<td>153</td>
<td>153</td>
<td>153</td>
<td></td>
</tr>
<tr>
<td>SMOKE GRAY</td>
<td>132</td>
<td>132</td>
<td>132</td>
<td></td>
</tr>
<tr>
<td>NIGHT BLACK</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>BLUE OSTER</td>
<td>191</td>
<td>255</td>
<td>255</td>
<td></td>
</tr>
<tr>
<td>BLUE OCEAN</td>
<td>189</td>
<td>223</td>
<td>253</td>
<td></td>
</tr>
<tr>
<td>BLUE POOL</td>
<td>135</td>
<td>182</td>
<td>245</td>
<td></td>
</tr>
<tr>
<td>DARK BLUE</td>
<td>130</td>
<td>133</td>
<td>255</td>
<td></td>
</tr>
<tr>
<td>LIME GREEN</td>
<td>214</td>
<td>255</td>
<td>214</td>
<td></td>
</tr>
<tr>
<td>LIGHT GREEN</td>
<td>175</td>
<td>255</td>
<td>179</td>
<td></td>
</tr>
<tr>
<td>NORMAL GREEN</td>
<td>153</td>
<td>171</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>SOFT PINK</td>
<td>255</td>
<td>191</td>
<td>191</td>
<td></td>
</tr>
<tr>
<td>RED LIGHT</td>
<td>255</td>
<td>128</td>
<td>128</td>
<td></td>
</tr>
<tr>
<td>REGULAR RED</td>
<td>255</td>
<td>86</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>RED HOT</td>
<td>255</td>
<td>50</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>LIGHT YELLOW</td>
<td>255</td>
<td>255</td>
<td>191</td>
<td></td>
</tr>
<tr>
<td>YELLOW SUN</td>
<td>255</td>
<td>255</td>
<td>164</td>
<td></td>
</tr>
<tr>
<td>REGULAR YELLOW</td>
<td>255</td>
<td>255</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>LIVE YELLOW</td>
<td>255</td>
<td>255</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>ACID ORANGE</td>
<td>255</td>
<td>199</td>
<td>94</td>
<td></td>
</tr>
<tr>
<td>REGULAR ORANGE</td>
<td>255</td>
<td>124</td>
<td>72</td>
<td></td>
</tr>
<tr>
<td>CITRIC ORANGE</td>
<td>255</td>
<td>166</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>DARK BROWN</td>
<td>208</td>
<td>106</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>REGULAR BROWN</td>
<td>232</td>
<td>210</td>
<td>198</td>
<td></td>
</tr>
<tr>
<td>LIGHT PURPLE</td>
<td>208</td>
<td>167</td>
<td>233</td>
<td></td>
</tr>
<tr>
<td>NORMAL PURPLE</td>
<td>188</td>
<td>156</td>
<td>197</td>
<td></td>
</tr>
<tr>
<td>DARK PURPLE</td>
<td>145</td>
<td>108</td>
<td>153</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 – Table Colors