	<b>TECHNICAL SPECIFICATION</b>				I-ET-3010.00-1200-800-P4X-010					
	CLIENT:							SHEET 1 of 11		
	JOB:							--		
	AREA:									
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FORM OWNED TO PETROBRAS N-0381 REV.L.										



TITLE:

**CRITERIA FOR ESTABLISHING CABLE  
CODES AND CABLE GLAND CODES**

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## 1 INTRODUCTION

### 1.1 Object

1.1.1 This specification establishes the requirements for:

- The creation of cable codes for the instrumentation cables to be installed at the UNIT;
- The creation of a list (Cable Code List) containing such cable codes;
- The creation of cable gland codes for the instrumentation cable glands to be installed at the UNIT;
- The creation of a list (Cable Gland Code List) containing such cable gland codes;
- The usage of such codes in other documents.

1.1.2 It is not the objective of this document to specify any characteristics of the instrumentation cables or cable glands. In order to do so, consult document I-ET-3010.00-1200-800-P4X-013 – GENERAL CRITERIA FOR INSTRUMENTATION PROJECTS.

1.1.3 This specification is not applicable to fiber optics and other communication cables (such as CAT V cables). For information regarding such cables, consult the document AUTOMATION NETWORK REQUIREMENTS of the project.

1.1.4 In this specification, whenever the term “cable” is mentioned, it applies to both cables and multicables.

### 1.2 Definitions

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

### 1.3 Abbreviations, Acronyms and Initialisms

A&C	Automation & Control
LSZH	Low Smoke Zero Halogen

## 2 REFERENCE DOCUMENTS

### 2.1 External references

#### 2.1.1 International Codes, Recommended Practices and Standards

<b>IEC – INTERNATIONAL ELECTROTECHNICAL COMMISSION</b>		
IEC	60092-360	ELECTRICAL INSTALLATIONS IN SHIPS – PART 360: INSULATING AND SHEATHING MATERIALS FOR SHIPBOARD AND OFFSHORE UNITS, POWER, CONTROL, INSTRUMENTATION AND TELECOMMUNICATION CABLES - EDITION 1.0
IEC	60331-1	TESTS FOR ELECTRIC CABLES UNDER FIRE CONDITIONS – CIRCUIT INTEGRITY – PART 1: TEST METHOD FOR FIRE WITH SHOCK AT A TEMPERATURE OF AT LEAST 830 °C FOR CABLES OF RATED VOLTAGE UP TO AND INCLUDING 0,6/1,0 KV AND WITH AN OVERALL DIAMETER EXCEEDING 20 MM
IEC	60331-21	TESTS FOR ELECTRIC CABLES UNDER FIRE CONDITIONS - CIRCUIT INTEGRITY - PART 21: PROCEDURES AND REQUIREMENTS - CABLES OF RATED VOLTAGE UP TO AND INCLUDING 0,6/1,0 KV - EDITION 1.0
IEC	60332-1-2	TESTS ON ELECTRIC AND OPTICAL FIBRE CABLES UNDER FIRE CONDITIONS – PART 1-2: TEST FOR VERTICAL FLAME PROPAGATION FOR A SINGLE INSULATED WIRE OR CABLE – PROCEDURE FOR 1 KW PRE-MIXED FLAME
IEC	60332-3-22 CATEGORY A	TESTS ON ELECTRIC AND OPTICAL FIBRE CABLES UNDER FIRE CONDITIONS – PART 3-22: TEST FOR VERTICAL FLAME SPREAD OF VERTICALLY-MOUNTED BUNCHED WIRES OR CABLES – CATEGORY A
IEC	61034-1	MEASUREMENT OF SMOKE DENSITY OF CABLES BURNING UNDER DEFINED CONDITIONS – PART 1: TEST APPARATUS
IEC	61034-2	MEASUREMENT OF SMOKE DENSITY OF CABLES BURNING UNDER DEFINED CONDITIONS – PART 2: TEST PROCEDURE AND REQUIREMENTS

### 2.2 Internal References

#### 2.2.1 Project Documents

I-ET-3000.00-1200-940-P4X-001	TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN
I-ET-3010.00-1200-800-P4X-013	GENERAL CRITERIA FOR INSTRUMENTATION PROJECTS

### 3 CABLE CODES

#### 3.1 DEFINITION

- 3.1.1 Cable codes are unique sequences of letters and numbers that specify a certain type of cable.
- 3.1.2 Cable codes are not the cable TAGs. TAG is unique for every loop whereas code is for a certain cable/multicable configuration that can be used in various loops. Cable TAGs are as per the latest revision of I-ET-3000.00-1200-940-P4X-001 - TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN.
- 3.1.3 The objectives of cable codes are:
- To create uniformity and easiness of comparison between cables and their respective cable glands;
  - To aggregate all cable parameters in order to allow analysis of its usage in every loop;
  - To clarify the compatibility of interfaces between several MANUFACTURERS, SUPPLIERS and CONTRACTOR.
- 3.1.4 Because characteristics of cables vary between different MANUFACTURERS, PETROBRAS only establishes the requisites for cable code creation. It is CONTRACTOR's responsibility to:
- Create the cable codes.
  - Issue a Cable Code List during Detail Engineering Design containing such codes and the main characteristics of the cables, as defined in sections 5 and 6.
  - Enforce that CONTRACTOR's sub-suppliers and PACKAGED UNIT's SUPPLIERS also create such codes and emit a similar document.

#### 3.2 STRUCTURE

- 3.2.1 Cable code structure shall be as follows:

**C-CCC-I-TTTT-NNN**

Where:

- C stands for cable;
- CCC – Trigram of the company, as per NI-1710;
- I – stands for Instrumentation;
- TTTT – Cable code types, as per Section 5 (up to 4 characters).
- NNN – Sequential of the cable type

## 4 CABLE PARTS NOMENCLATURE

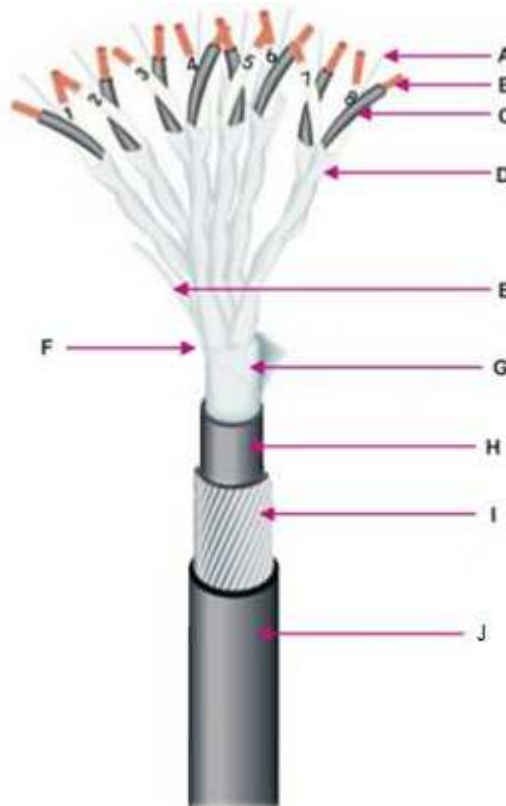


Figure 1 – Cable components

4.1 In order to standardize the terminology used for cable components, Figure 1 presents the cable components. Each letter name is presented below:

- A: Drain Wire of Individual Screen
- B: Conductor
- C: Insulation
- D: Individual Screen
- E: Drain Wire of Overall Screen
- F: Filler
- G: Overall Screen
- H: Inner Bedding
- I: Armoring
- J: Outer Sheath

## 5 CABLE CODE TYPES

- 5.1 The following cable codes shall be adopted during Engineering Detailing Design. They can be used, modified, deleted or even new codes may be created.
- 5.2 Regardless of the adoption of the below list, the final list of the cable codes, along with their meaning, shall be sent to PETROBRAS.
- 5.3 Cable Type O (instrument cable with overall screen)

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5.3.1 Instrumentation cable, Overall screen, Halogen free, Flame retardant, grade 300 V, maximum conductor temperature: 85° C.

5.3.2 Overall Screen material: Aluminum backed polyester tape & tinned copper drain wire.

5.4 Cable Type I (instrument cable with individual screen and overall screen)

5.4.1 Instrumentation cable, Individual screen, Halogen free, Flame retardant, grade 300 V, maximum conductor temperature: 85° C.

5.4.2 Individual Screen material: Aluminum backed polyester tape & tinned copper drain wire.

5.4.3 Overall Screen material: Aluminum backed polyester tape & tinned copper drain wire.

5.5 Cable Type OF

5.5.1 The composition of cable type OF is identical to cable type O, except for the use of an additional mica tape for Fire Resistance.

5.6 Cable Type IF

5.6.1 The composition of cable type IF is identical to cable type I, except for the use of an additional mica tape for Fire Resistance.

5.7 Cable Type OFB

5.7.1 The composition of cable type OFB is identical to cable type OF, except for a Blue outer sheath.

Note: This type of cable shall be used solely for Intrinsic Safety application

5.8 Cable Type IB

5.8.1 The composition of cable type IB is identical to cable type I, except for a Blue outer sheath.

Note: This type of cable shall be used solely for Intrinsic Safety application.

5.9 When the respective cable is armored, a suffix "A" shall be used. When the cable is non-armored, a suffix "N" shall be used. Armor and screen shall be mutually insulated.

5.10 All IB type cables shall be armored.



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## 6 CABLE CODE LIST

6.1 This document shall have at least the fields shown in Figure 2. See ANNEX A – CABLE CODE TEMPLATE for the Excel version of the template.

General properties				Cable characteristics for cable gland sizing				
Cable Code	Manufacturer	Conductor section area (mm <sup>2</sup> )	Number of conductors	Diameter of inner bedding (mm)	Armour wire diameter (mm)	Armouring type	Cable Outer Sheath diameter (mm)	Compatible Cable Gland Codes
By CONTRACTOR:  Ex: C-XXX-I-IN-001 C-XXX-I-ON-003 C-XXX-I-OA-004	By CONTRACTOR	By manufacturer: - 1.0 - 1.5 - 2.5	By manufacturer: - Number of pairs or Number of triads or Number of quads  Ex: - 2 Pairs or - 4 Triads or - 1 Quad	By manufacturer	If cable is not armoured: N/A  If cable is armoured: By manufacturer	If cable is not armoured: None  If cable is armoured: By manufacturer	By manufacturer	By CONTRACTOR  Ex: G-XXX-I-SS-004 G-XXX-I-NB-005
Cable characteristics								
Isolation Voltage	Insulation Material	Insulation color	Individual screen	Overall screen	Fire resistant	Minimum bend radius	Outer Sheath Material	Outer Sheath Color
By manufacturer  Ex: - 300 V or - 1 kV	By manufacturer:  Ex: - HF XLPE or - HF EPR	By manufacturer:  Ex: - Black and white or - Black, white, red or - Black, white, red, blue	By manufacturer:  Ex: - NONE or - Aluminum foil coated with polyester	By manufacturer:  Ex: - NONE or - Aluminum foil coated with polyester	By manufacturer  - Yes - No, only flame retardant	By manufacturer	By manufacturer  Ex: SHF 2	By manufacturer:  Ex: - Grey - Blue
Remaining Mechanical and Electrical properties of the cable							Other references	
Max. conductor DC Resistance @20°C	Nom. Mutual Capacitance @1kHz	Characteristic Impedance	Nom. Inductance @ 1kHz	Operating temperature Range	Maximum Pulling Tension	Approximate Mass	Material requisitions (RM) in which the cable code is present	
By manufacturer  Ex: 40 Ω/km	By manufacturer  Ex: 90 pF/m	By manufacturer  Ex: 400 Ω	By manufacturer  Ex: 1100 mH/km	By manufacturer  Ex: -15°C to 90°C	By manufacturer  Ex: 60 N	By manufacturer  Ex: 3.1 kg / 100m	By CONTRACTOR I-RM-3010.XX-5500-800-YYY-001	

Figure 2 – Minimum set of characteristics to be described in the cable codes.

6.2 This document shall be issued during detail design phase. This document complements the Cable list.

6.3 Final format shall be .xlsx (Excel format).



## 7 CABLE CODE SELECTION

- 7.1 In order to decide which application shall have which cable code, consult I-ET-3010.00-1200-800-P4X-013 - GENERAL CRITERIA FOR INSTRUMENTATION PROJECTS.

## 8 CABLE GLAND CODES

### 8.1 DEFINITION

- 8.1.1 Cable gland codes are unique sequences of letters and numbers that specify a certain type of cable gland.
- 8.1.2 The objective of cable gland codes is to create uniformity and easiness of comparison between cables and their respective cable glands. This will help to clarify the compatibility of interfaces between several MANUFACTURERS, SUPPLIERS and CONTRACTOR.
- 8.1.3 Because characteristics of cable glands vary between different MANUFACTURERS, PETROBRAS only establishes the requisites for cable gland code creation.

### 8.2 STRUCTURE

- 8.2.1 Cable gland code structure shall be as follows:

G-CCC-I-TTT-NNN

Where:

- G – stands for Gland;
- CCC – Trigram of the company, as per NI-1710;
- I – stands for Instrumentation;
- TTT – Cable gland code types, as per Section 9 (up to 3 characters).
- NNN – Sequential of the cable gland type

## 9 CABLE GLAND CODES

- 9.1 The following cable gland codes shall be adopted during Engineering Detailing Design. They can be used, modified, deleted or even new codes may be created.
- 9.2 Regardless of the adoption of the below list, the final list of the cable gland codes, along with their meaning, shall be sent to PETROBRAS.
- 9.3 Here is the list:
- Cable gland code SS → Cable gland material Stainless steel AISI-316
  - Cable gland code NY → Cable gland material Nylon
  - Cable gland code NB → Cable gland material Naval Bronze

## 10 CABLE GLAND CODE LIST

- 10.1 This document shall have at least the fields the shown in Figure 3. See ANNEX B – CABLE GLAND CODE TEMPLATE for the Excel version of the template.

General Properties		Cable gland characteristics		
Cable Gland Codes	Manufacturer	Cable gland material	Cable Gland Hazardous area type of protection	IP Code
By CONTRACTOR	By CONTRACTOR	By manufacturer	By manufacturer	By manufacturer
Ex: G-KFB-I-SS-004		Ex: Stainless Steel	Ex: Ex d IIA T3	Ex: IP 56

Cable characteristics for cable gland sizing							
Minimum Allowable Diameter of inner bedding (mm)	Maximum Allowable Diameter of inner bedding (mm)	Minimum Allowable Armour wire diameter (mm)	Maximum Allowable Armour wire diameter (mm)	Armouring type	Minimum Allowable Cable Outer Sheath Diameter (mm)	Maximum Allowable Cable Outer Sheath Diameter (mm)	Compatible Cable Codes
By manufacturer	By manufacturer	By manufacturer Ex: 0.80 mm	By manufacturer Ex: 1.4 mm	- None - Steel Wire Braid	By manufacturer	By manufacturer	By CONTRACTOR: Ex: C-KFB-I-I-001 C-KFB-I-O-003

Other references
Material requisitions (RM) in which the cable gland code is present
By CONTRACTOR I-RM-3010.XX-5500-800-YYY-002

Figure 3 – Minimum set of characteristics to be described in the cable gland codes.

10.2 This document shall be issued during detail design phase.

10.3 Final format shall be .xlsx (Excel format).

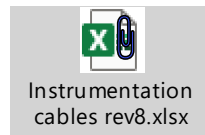
## 11 CABLE CODES AND CABLE GLAND CODES USAGE

11.1 Cable codes and cable gland codes shall be referred in cable list, Material requisitions and in the database from associated CAE tool.

11.2 Every Cable Tag present in the Cable list shall have an additional column indicating the respective Cable Code.

## 12 ANNEXES

### 12.1 ANNEX A – CABLE CODE TEMPLATE



### 12.2 ANNEX B – CABLE GLAND CODE TEMPLATE

