



نگهداشت و افزایش تولید میدان نفتی بینک
سطح الارض و ابنیه تحت الارض

عمومی و مشترک



شماره پیمان:

۰۵۳ - ۰۷۳ - ۹۱۸۴

SPECIFICATION FOR INSTRUMENT/F&G CABLES

نسخه	سریال	نوع مدرک	رشته	تسهیلات	صادرکننده	بسته کاری	پروژه
D02	0010	SP	IN	000	PEDCO	GNRAL	BK

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طرح نگهداشت و افزایش تولید ۲۷ مخزن

SPECIFICATION FOR INSTRUMENT/F&G CABLES

نگهداشت و افزایش تولید میدان نفتی بینک

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IDC: Inter-Discipline Check
IFC: Issued For Comment
IFA: Issued For Approval
AFD: Approved For Design
AFC: Approved For Construction
AFP: Approved For Purchase
AFQ: Approved For Quotation
IFI: Issued For Information
AB-R: As-Built for CLIENT Review
AB-A: As-Built -Approved

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1.0 INTRODUCTION

Binak oilfield in Bushehr province is a part of the southern oilfields of Iran, is located 20 km northwest of Genaveh city.

With the aim of increasing production of oil from Binak oilfield, an EPC/EPD Project has been defined by NIOC/NISOC and awarded to Petro Iran Development Company (PEDCO). Also PEDCO (as General Contractor) has assigned the EPC-packages of the Project to "Hirgan Energy - Design and Inspection" JV.



GENERAL DEFINITION

The following terms shall be used in this document.

CLIENT:	National Iranian South Oilfields Company (NISOC)
PROJECT:	Binak Oilfield Development – General Facilities
EPD-EPC CONTRACTOR:	Petro Iran Development Company (PEDCO)
EPC CONTRACTOR:	Joint Venture of: Hirgan Energy – Design & Inspection(D&I) Companies
VENDOR:	The firm or person who will fabricate the equipment or material.
EXECUTOR:	Executor is the party which carries out all or part of construction and/or commissioning for the project.
THIRD PARTY INSPECTOR (TPI):	The firm appointed by EPD/EPC CONTRACTOR (GC) and approved by CLIENT (in writing) for the inspection of goods.
SHALL:	Is used where a provision is mandatory.
SHOULD:	Is used where a provision is advisory only.
WILL:	Is normally used in connection with the action by CLIENT rather than by an EPC/EPD CONTRACTOR, supplier or VENDOR.
MAY:	Is used where a provision is completely discretionary.

2.0 SCOPE

This Specification covers the technical requirements relating to the design, manufacturing, assembly and supply of instrument/F&G cables for the “Preservation and Production Increase of Binak oilfield”.

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3.0 NORMATIVE REFERENCES

3.1 LOCAL CODES AND STANDARDS

- IPS-C-IN-190 Installation and Construction Standard for Transmission Systems
- IPS-E-IN-190 Engineering Standard for Transmission Systems (2010)
- IPS-G-IN-220 Engineering and Installation Standard for Control Centers
- IPS-M-IN-100 Material and Equipment Standard for General Instrumentation, Factory Inspection And Testing Of Instruments And Instrument Systems
- IPS-M-IN-190 Material and Equipment Standard for Transmission Systems (2010)
- IPS-M-EL-271 Material and Equipment Standard For Low Voltage Cables and Wires (2003)

3.2 INTERNATIONAL CODES AND STANDARDS

- BS 5099 Specification for spark testing electric cables
- BS PAS 5308 Specification for Instrumentation Cables
- BS EN 50267 Common test methods for cables under fire conditions- Tests on gases evolved during combustion of materials from cables
- BS EN 50288-7 Multi-element metallic cables used in analogue and digital communication and control –Part7: Sectional specification for instrumentation and control cables
- BS EN 50290-2-26 Common design rules and construction — Halogen free flame retardant insulation compounds
- BS EN 50290-2-27 Common design rules and construction — Halogen free flame retardant thermoplastic sheathing compounds
- IEC 60028 International Standard Of Resistance Copper
- IEC 60227 Polyvinyl Chloride Insulated Cables of Rated Voltages up to and including 450/750 V
- IEC 60228 Conductors of Insulated Cables
- IEC 60245-1 to 3 Rubber Insulated Cables-Rated voltages up to & included 450/750 V
- IEC 60331 Tests For Electric Cables Under Fire Conditions:

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Circuit Integrity.

- IEC 60332 Tests On Electric Cables Under Fire Conditions.
- IEC 60364-5-51 Electrical installations of buildings–Selection and erection of electrical equipment
- IEC 60446 Color Identification Insulated And Non-Insulated Core
- IEC 60502 Power Cables with Extruded Insulation and Their Accessories for Rated Voltages from 1 kV
- IEC 60584 Thermocouples
- IEC 60754-1&2 Test on gases evolved during combustion of materials from cables
- IEC 60811 Test Methods For Insulation And Sheaths Of Electric Cables And Cords (Electrometric And Thermoplastic Compounds)
- IEC 61034 Measurement Of Smoke Density Of Electric Cables Burning Under Defined Conditions, Test Procedure And Requirements
- IEC 61158-2 Industrial communication networks – Fieldbus specifications –Part 2: Physical layer specification and service definition
- ISO 4589 Determination of burning behaviour by oxygen Index (1996)
- ITU Rec. G652 Characteristics of a Single Mode Optical Fiber Cable (2005)
- UL 1581 article 1200 Reference standard for electrical wires, cables, and flexible cords
- ICEA 5-73-532 Standard for control, thermocouple extension and instrumentation cables

Vendor shall state the additional Codes and Standards if necessary.

3.3 THE PROJECT DOCUMENTS

- | | |
|---------------------------------|--|
| • BK-GNRL-PEDCO-000-PR-BD-0001 | Process Basis of Design |
| • BK-GNRL-PEDCO-000-IN-SP-0001 | Specification For Instrumentation |
| • BK-SSGRL-PEDCO-110-IN-DC-0002 | Instrument and Control Design Criteria |
| • BK-GCS-PEDCO-120-IN-DC-0002 | Instrument and Control Design Criteria |
| • BK-PPL-PEDCO-320-IN-DC-0001 | Instrument and Control Design Criteria |
| • BK-GNRL-PEDCO-000-IN-SP-0009 | Specification for F&G Sensor and Devices |

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- BK-GNRAL-PEDCO-000-IN-SP-0012 Specification for F&G System

3.4 ENVIRONMENTAL DATA

Refer to "Process Basis of Design; Doc. No. BK- GNRAL-PEDCO-000-PR-BD-0001"

4.0 ABBRAVIATIONS

NISOC :	National Iranian South Oil Company
AFC :	Approved For Construction
AFD :	Approved For Design
ESD :	Emergency Shut down
IE :	Instrument Electronic Earth
IPE :	Instrument Protective Earth
IS :	Intrinsically Safe
PVC :	PolyVinyl Chloride
SWA :	Steel Wire Armored
XLPE :	Crossed Linked Polyethylene

5.0 ORDER OF PRECEDENCE

In case of any conflict between the contents of this document or any discrepancy between this document and other project documents or reference standards, this issue must be reported to the CLIENT. The final decision in this situation will be made by CLIENT.

6.0 TECHNICAL SPECIFICATION

6.1 GENERAL

End of cables shall be thoroughly sealed to prevent entrance of moisture.

All cables shall be designed for Low Smoke and Non Toxic fumes emission. All cables shall be at least heat and flame retardant.

All cables shall be resistant to abrasion, water according to IEC 60364-5-51 (AD7), UV according to UL 1581 article 1200, oil and aliphatic hydrocarbons according to ICEA 5-73-532, gas/vapor tight, burn with a low release of Halogens and have an oxygen index better than 32 according to ISO 4589 or ASTM D2863.

The cable shall be suitable for application in temperature range of -20 to +75 °C.

Vendor shall specify the minimum installation handling temperature for each cable type.

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All materials that use for insulation, inner sheath and outer sheath shall be low smoke according to the IEC 61034 and halogen free according to the IEC 60754/BS EN 50267.



The overall jacket material should be moisture resistant, abrasion resistant and compatible with the environment and flame retardant specified as per IEC 60332. When cable used in emergency shutdown system, overall jacket as specified material shall be fire resistant as per IPS-IN-E-190..

Fire resistant cables shall be able to withstand the IEC 60331 fire resistant test.

Cables for external installation (Outdoor) shall be armored and cables that installed and fully routed within control building (Indoor) shall be Non-Armored.

All F&G system cables shall be fire resistant.

All cables that include ESD Energized to trip signals shall be fire resistant.

Where direct buried cables are to be used in process area, where area are susceptible to liquid hydrocarbon, they shall be considered as oil resistance, round steel wire armored (SWA) type, with lead sheath.



The minimum thickness of insulation on single wires shall be 0.38 mm .Insulation rating of single wires shall be not less than 600 volts as per IPS-IN-M-190.

For Single pair cables,pairs of wire shall be twisted at least 20 times per meter and have total coverage electrostatic shield with copper drain wire extending the length of the conductors. An overall jacket shall be provided for each pair. Analogue wires or cables shall be enclosed in conduits or and in lugs, and should not be mixed with AC signal wiring or power wires.

Multi pare cable wire size should be minimum 1.0 mm² stranded copper, and insulated.

Individual pairs of wires shall have number identification.

Multiple pairs shall be twisted at least 6 times per meter and shall have total coverage of electrostatic shield with 0.5 mm² stranded copper drain wire extending the length of the conductors.An insulated communication wire should be provided within each cable.Where shields are specified for individual pairs of wires, each shield shall be insulated from other shields

6.2 CONDUCTORS

The conductors shall be stranded tinned copper wire according to IEC60228. The conductor for thermocouple shall be as following table acc. to IEC-60584-1:

Thermocouple Type	Positive Leg	Negative Leg
R	Platinum-%13 Rhodium	Platinum

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Thermocouple Type	Positive Leg	Negative Leg
S	Platinum-%10 Rhodium	Platinum
B	Platinum-%30 Rhodium	Platinum-%6 Rhodium
J	Iron	Copper-Nickel
T	Copper	Copper-Nickel
E	Nickel-Chromium	Copper-Nickel
K	Nickel-Chromium	Nickel-Aluminum
N	Nickel-Chromium-Silicon	Nickel- Silicon

6.3 RATED VOLTAGE

Analog and Discrete signals: insulation grade to be 300/500 V according to BS EN 50288-7.

ON/OFF commands 48VDC and 110 & 230 VAC: insulation grade to be 600/1000V according to IEC 60502-1.

Instrument earth cable: Insulation grade to be 450/750 V according to EN 50525-3-31.

6.4 INSTRUMENT SIGNAL CATEGORY

Analogue and Digital signals:

- | | |
|-----------------------------------|---|
| • I.S. Flame Retardant | Outer sheath colors: LT. Blue |
| • Non I.S. Flame Retardant | Outer sheath colors: Grey |
| • IS Fire Resistant for ESD | Outer sheath colors: LT. Blue/Red Strip |
| • Non I.S. Fire Resistant for ESD | Outer sheath colors: Gray/Red Strip |
| • Fire Resistant for F&G | Outer sheath colors: Red |

Thermocouple temperature measurement:



- Refer to standard IEC-60584-3.

Earth:

- | | |
|--|--|
| • IPE (Instrument Protective Earth) | Outer sheath colors: Yellow/Green Stripe |
| • IE (Instrument Electronic Earth) | Outer sheath colors: Green |
| • ISE (Instrument Safe Electronic Earth) | Outer sheath colors: Yellow/Blue Strip |

Miscellaneous:

- | | |
|----------------------------|---|
| • Power | Outer sheath colors: Black |
| • Data Highway/Serial Link | Outer sheath colors: Vendor Specification |
| • Fiber Optic | Outer sheath colors: Vendor Specification |

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6.5 CORE COLORS

Power cables:

- 2-cores : Brown, Blue

Instrument cables:

- Single pair : Black, White,
- Multi pair : Black, White,

The pairs shall be identified numerically and sequentially,

- Single Triple : White, Red, Blue,
- Multi Triple : White, Red, Blue,

The triples shall be identified numerically and sequentially,

- Single quad : Black, White, Black with White strips, White with Black strips,
- Multi quad : Black, White, Black with White strips, White with Black strips,

The quads shall be identified numerically and sequentially,

Thermocouple color coding shall be as follow:



- The insulation of the negative conductor shall be WHITE for all thermocouple types.
- The insulation of the positive conductor shall be as following table:

Thermocouple Type	T	E	J	K	N	B	R	S
Color of positive conductor and sheath insulation	Brown	Violet	Black	Green	Pink	Grey	Orange	Orange

6.6 CHARACTERISTICS FOR INSTRUMENT CABLES:

Instrument cables (IS & NIS) shall have the following maximum characteristics:

Mutual Capacitance: <150 nF/km

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Unbalance Capacitance: 500 pF/500m

Inductance to resistance ratio (Acc. to BS EN 50288-7): < 25 $\mu\text{H}/\text{ohm}$ for up to 1mm²

< 40 $\mu\text{H}/\text{ohm}$ for 1.5 mm²

< 60 $\mu\text{H}/\text{ohm}$ for 2.5 mm²

6.7 CABLE MARKING:

The outer sheath of cable shall be embossed at regular intervals with marks to distinguish the following data as a minimum:

- Manufacturer's name and year of manufacture,
- Voltage grade (specified voltage),
- Number of core and core sizes,
- Cable type,
- Quality of outer sheath.
- Total remaining length of the cable

6.8 CABLES DRUMS:

Cable shall be supplied in standard production lengths and drum types and sizes for the quantities of each type of cable required. All drum lengths shall be continuous. Cable or conductor jointing in any form is unacceptable.

Cable drums shall each be provided with two 200mm x 200mm identification labels made from stainless steel or similar durable material, securely affixed one per side and at tile top and bottom of each drum.

Each label shall be engraved with the following information as a minimum:

- Supplier's Name,
- Supplier's drum number,
- Cable Size and Identification Code
- Rated voltage,
- Purchase Order Number/Item Number
- Drum length (meter) and identification number,
- Net and gross weights (kg),
- Weight per meter (kg),
- Purchaser's quality control reference,
- Date of manufacture,
- Project name,
- Purchaser's name and address.

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک								
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	BK	GNRAL	PEDCO	000	IN	SP	0010	D02	

7.0 CABLE TYPES:

7.1 I&C SINGLE-PAIR CABLES WITH OVERALL SCREEN, RATED VOLTAGE 300/500 V

Cross section: 1.5 mm²

Application:

For 24V D.C. Analogue and Discrete Signals (transmitter, control valve, switch, I.S. solenoid valve, running /fault and on/off statuses...)

Conductor:

Tinned annealed 7-stranded copper in accordance with BS EN/IEC 60228

Insulation:

Flame retardant type: XLPE, Low smoke halogen Free in accordance with BS EN 50288-7.

Fire Resistant type: Silicone rubber, Low smoke halogen free in accordance with IEC 60245-3 or Mica Glass Tape + XLPE, Low smoke halogen free in accordance with BS EN 50288-7.

Twinning:

The insulated conductors shall be twisted together to form a pair, triple or quad. The lay length of a pair, triple or quad shall be in accordance with BS EN 50288-7.

Wrapping for overall screen:

The pairs, triples or quads shall be laid up to form a cable with a minimum of cross talk and wrapped with Polyester tape 0.023 mm Thick, helically wound with 25 % overlap.

Drain wire:

Stranded tinned annealed copper wire with a cross-section 0.5mm² as per BS PAS 5308.

Overall screen:

The pairs/triples/quads shall be screened with aluminum backed Mylar tape helically wrapped with a 25 % overlap. Aluminum on the Inside to be in continuous contact with a bare drain wire. Thickness of screen shall be 0.008 mm aluminum on 0.010 mm Mylar tape as per BS PAS 5308.

Wrapping below inner sheath:

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک								
شماره پیمان: ۰۵۳ - ۰۷۳ - ۹۱۸۴	SPECIFICATION FOR INSTRUMENT/F&G CABLES								شماره صفحه: ۱۳ از ۲۸
	پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	
	BK	GNRAL	PEDCO	000	IN	SP	0010	D02	

The screened cable shall be wrapped with Polyester tape helically wound.

Inner sheath (Not applicable for non-armored cables):

Low smoke halogen free flame retardant compound in accordance with BS EN 50288-7.

Armor (Not applicable for non-armored cables):

Galvanized round steel wire armor (SWA), having approx. 90% coverage, density and thickness in accordance with BS EN 50288-7.

Overall outer sheath:

Low smoke halogen free flame retardant compound in accordance with BS EN 50288-7.

The outer sheath shall be resistant to abrasion, water, UV, and aliphatic hydrocarbons.

Outer sheath color:

In accordance with cables identification and service (See Section 6.4)

7.2 I&C MULTI-PAIR CABLES WITH INDIVIDUAL AND OVERALL SCREEN, RATED VOLTAGE 300/500 V

Cross section: 1.0 mm²

Application: For 24V D.C. Analogue Signals (transmitter, control valve...)

Conductor: Tinned annealed 7-stranded copper in accordance with BS EN/IEC 60228.

Insulation:

Flame retardant type: XLPE, Low smoke halogen Free in accordance with BS EN 50288-7.



Fire Resistant type: Silicone rubber, Low smoke halogen free in accordance with IEC 60245-3 or Mica Glass Tape + XLPE, Low smoke halogen free in accordance with BS EN 50288-7.

Twinning:

The insulated conductors shall be twisted together to form a pair, triple or quad. The lay length of a pair, triple or quad shall be in accordance with BS EN 50288-7.

Wrapping for individual screen:

Each pair/triple/quad shall be wrapped with Polyester tape 0.023 mm Thick, helically wound with 25 % overlap.

 NISOC	<p>نگهداشت و افزایش تولید میدان نفتی بینک</p> <p>سطح الارض و ابنیه تحت الارض</p> <p>عمومی و مشترک</p>								
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	BK	GNRAL	PEDCO	000	IN	SP	0010		D02

Drain wire:

Tinned annealed 7-stranded copper with a cross-section 0.5mm² as per BS PAS 5308

Individual screen:

Each pair/triple/quad shall be screened with aluminum backed Mylar tape helically applied with 25 % overlap. Aluminum on the inside to be in continuous contact with a bare drain wire. Thickness of screen shall be 0.008 mm aluminum on 0.010 mm Mylar tape as per BS PAS 5308.

Each screen shall be insulated from the remaining cable components by the application of suitable tapes and numbered in accordance with the pair numbering system.

Wrapping for overall screen:

The pairs, triples or quads shall be laid up to form a cable with a minimum of cross talk and wrapped with Polyester tape 0.023 mm Thick, helically wound with 25 % overlap.

Drain wire:

Stranded tinned annealed copper wire with a cross-section 0.5mm² as per BS PAS 5308.

Overall screen:

The pairs/triples/quads shall be screened with aluminum backed Mylar tape helically wrapped with a 25 % overlap. Aluminum on the Inside to be in continuous contact with a bare drain wire. Thickness of screen shall be 0.008 mm aluminum on 0.010 mm Mylar tape as per BS PAS 5308.

Wrapping below inner sheath:

The screened cable shall be wrapped with Polyester tape helically wound.

Inner sheath (Not applicable for non-armored cables):

Low smoke halogen free flame retardant compound in accordance with BS EN 50288-7.



Armor (Not applicable for non-armored cables):

Galvanized round steel wire armor (SWA), having approx. 90% coverage, density and thickness in accordance with BS EN 50288-7.

Overall outer sheath:

Low smoke halogen free flame retardant compound in accordance with BS EN 50288-7.

The outer sheath shall be resistant to abrasion, water, UV, and aliphatic hydrocarbons.

 NISOC	<p>نگهداشت و افزایش تولید میدان نفتی بینک</p> <p>سطح الارض و ابنیه تحت الارض</p> <p>عمومی و مشترک</p>								
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Outer sheath color:

In accordance with cables identification and service (See Section 6.4)

7.3 I&C MULTI-PAIR CABLES WITH OVERALL SCREEN, RATED VOLTAGE 300/500 V

Cross section: 1.0 mm²

Application: For 24V D.C. Discrete Signals (switch, I.S. solenoid valve, running/fault and on/off status...)

Conductor: Tinned annealed 7-stranded copper in accordance with BS EN/IEC 60228.

Insulation:

Flame retardant type: XLPE, Low smoke halogen Free in accordance with BS EN 50288-7.

Fire Resistant type: Silicone rubber, Low smoke halogen free in accordance with IEC 60245-3 or Mica Glass Tape + XLPE, Low smoke halogen free in accordance with BS EN 50288-7.

Twinning:

The insulated conductors shall be twisted together to form a pair, triple or quad. The lay length of a pair, triple or quad shall be in accordance with BS EN 50288-7.

Wrapping for overall screen:

The pairs, triples or quads shall be laid up to form a cable with a minimum of cross talk and wrapped with Polyester tape 0.023 mm Thick, helically wound with 25 % overlap.

Drain wire:

Tinned annealed 7-stranded copper with a cross-section 0.5mm² as per BS PAS 5308



Overall screen:

The pairs/triples/quads shall be screened with aluminum backed Mylar tape helically wrapped with a 25 % overlap. Aluminum on the Inside to be in continuous contact with a bare drain wire. Thickness of screen shall be 0.008 mm aluminum on 0.010 mm Mylar tape as per BS PAS 5308.

Wrapping below inner sheath:

The screened cable shall be wrapped with Polyester tape helically wound.

Inner sheath (Not applicable for non-armored cables):

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک								
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	BK	GNRAL	PEDCO	000	IN	SP	0010	D02	

Low smoke halogen free flame retardant compound in accordance with BS EN 50288-7.

Armor (Not applicable for non-armored cables):

Galvanized round steel wire armor (SWA), having approx. 90% coverage, density and thickness in accordance with BS EN 50288-7.

Overall outer sheath:

Low smoke halogen free flame retardant compound in accordance with BS EN 50288-7.

The outer sheath shall be resistant to abrasion, water, UV, and aliphatic hydrocarbons.

Outer sheath color:

In accordance with cables identification and service (See Section 6.4)

7.4 I&C SINGLE-PAIR / MULTI-PAIR CABLES WITHOUT SCREEN, RATED VOLTAGE 600/1000 V

Cross Section: 2.5mm² min. (Depends to voltage drop calculation)

Application: For Discrete Signals (24VDC & 110/230 VAC start/stop command, 24VDC N.I.S. solenoid valve, 48 VDC solenoid valve...)

Conductor: Tinned annealed 7-stranded copper in accordance with BS EN/IEC 60228.

Insulation:

Flame retardant type: XLPE, Low smoke halogen Free in accordance with IEC 60502-1.

Fire Resistant type: Silicone rubber, Low smoke halogen free in accordance with IEC 60245-3 or Mica Glass Tape + XLPE, Low smoke halogen free in accordance with BS EN 50288-7.

Lay up:



The cores shall be laid up to form a cable with a minimum of cross talk.

Wrapping below inner sheath:

The cable shall be wrapped with Polyester tape helically wound.

Inner sheath (Not applicable for non-armored cables):

Low smoke halogen free flame retardant compound in accordance with IEC 60502-1.

 NISOC	<p>نگهداشت و افزایش تولید میدان نفتی بینک</p> <p>سطح الارض و ابنیه تحت الارض</p> <p>عمومی و مشترک</p>																									
شماره پیمان: ۰۵۳ - ۰۷۳ - ۹۱۸۴	<table><tr><th colspan="8">SPECIFICATION FOR INSTRUMENT/F&G CABLES</th></tr><tr><th>پروژه</th><th>بسته کاری</th><th>صادر کننده</th><th>تسهیلات</th><th>رشته</th><th>نوع مدرک</th><th>سریال</th><th>نسخه</th></tr><tr><td>BK</td><td>GNRAL</td><td>PEDCO</td><td>000</td><td>IN</td><td>SP</td><td>0010</td><td>D02</td></tr></table>	SPECIFICATION FOR INSTRUMENT/F&G CABLES								پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	BK	GNRAL	PEDCO	000	IN	SP	0010	D02	شماره صفحه : ۱۷ از ۲۸
SPECIFICATION FOR INSTRUMENT/F&G CABLES																										
پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه																			
BK	GNRAL	PEDCO	000	IN	SP	0010	D02																			

Armor (Not applicable for non-armored cables):

Galvanized round steel wire armor (SWA), density and thickness in accordance with IEC 60502-1

Overall outer sheath:

Low smoke halogen free flame retardant compound in accordance with IEC 60502-1.

The outer sheath shall be resistant to abrasion, water, UV, and aliphatic hydrocarbons.

Outer sheath color:

In accordance with cables identification and service (See Section 6.4)

7.5 POWER SINGLE-CORE / MULTI-CORE CABLES WITHOUT SCREEN, RATED VOLTAGE 600/1000 V

Cross Section: 2.5mm² min. (Depends to voltage drop calculation)

Application: For power supply (24 VDC, 230 VAC power supply, instrument power supply)

Conductor: Tinned annealed 7-stranded copper in accordance with BS EN/IEC 60228.

Insulation:

Flame retardant type: XLPE, Low smoke halogen Free in accordance with IEC 60502-1.

Fire Resistant type: Silicone rubber, Low smoke halogen free in accordance with IEC 60245-3 or Mica Glass Tape + XLPE, Low smoke halogen free in accordance with BS EN 50288-7.

Lay up:

The cores shall be laid up to form a cable with a minimum of cross talk.

Wrapping below inner sheath:



The cable shall be wrapped with Polyester tape helically wound.

Inner sheath (Not applicable for non-armored cables):

Low smoke halogen free flame retardant compound in accordance with IEC 60502-1.

Armor (Not applicable for un- armored cables):

Galvanized round steel wire armor (SWA), density and thickness in accordance with IEC 60502-1

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک								
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	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GNRAL	PEDCO	000	IN	SP	0010	D02	

Overall outer sheath:

Low smoke halogen free flame retardant compound in accordance with IEC 60502-1.

The outer sheath shall be resistant to abrasion, water, UV, and aliphatic hydrocarbons.

Outer sheath color:

In accordance with cables identification and service (See Section 6.4)

7.6 F&G SINGLE-PAIR WITH OVERALL SCREEN / MULTI-PAIR CABLES WITH INDIVIDUAL AND OVERALL SCREEN, RATED VOLTAGE 300/500 V

Cross section: 1.5 mm²

Application:

For 24V D.C. Analogue and Discrete Signals (smoke detector, heat detector, manual call point, switch...)

Conductor:

Tinned annealed 7-stranded copper in accordance with BS EN/IEC 60228

Insulation:

Fire Resistant type: Silicone rubber, Low smoke halogen free in accordance with IEC 60245-3 or Mica Glass Tape + XLPE, Low smoke halogen free in accordance with BS EN 50288-7.

Twinning:

The insulated conductors shall be twisted together to form a pair, triple or quad. The lay length of a pair, triple or quad shall be in accordance with BS EN 50288-7.



Wrapping for individual screen:

Each pair/triple/quad shall be wrapped with Polyester tape 0.023 mm Thick, helically wound with 25 % overlap.

Drain wire:

Tinned annealed 7-stranded copper with a cross-section 0.5mm² as per BS PAS 5308

Individual screen:

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک								
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	BK	GNRAL	PEDCO	000	IN	SP	0010	D02	

Each pair/triple/quad shall be screened with aluminum backed Mylar tape helically applied with 25 % overlap. Aluminum on the inside to be in continuous contact with a bare drain wire. Thickness of screen shall be 0.008 mm aluminum on 0.010 mm Mylar tape as per BS PAS 5308.

Each screen shall be insulated from the remaining cable components by the application of suitable tapes and numbered in accordance with the pair numbering system.

Wrapping for overall screen:

The pairs, triples or quads shall be laid up to form a cable with a minimum of cross talk and wrapped with Polyester tape 0.023 mm Thick, helically wound with 25 % overlap.

Drain wire:

Stranded tinned annealed copper wire with a cross-section 0.5mm² as per BS PAS 5308.

Overall screen:

The pairs/triples/quads shall be screened with aluminum backed Mylar tape helically wrapped with a 25 % overlap. Aluminum on the Inside to be in continuous contact with a bare drain wire. Thickness of screen shall be 0.008 mm aluminum on 0.010 mm Mylar tape as per BS PAS 5308.

Wrapping below inner sheath:

The screened cable shall be wrapped with Polyester tape helically wound.

Inner sheath (Not applicable for non-armored cables):

Low smoke halogen free flame retardant compound in accordance with BS EN 50288-7.

Armor (Not applicable for non-armored cables):

Galvanized round steel wire armor (SWA), having approx. 90% coverage, density and thickness in accordance with BS EN 50288-7.



Overall outer sheath:

Low smoke halogen free flame retardant compound in accordance with BS EN 50288-7.

The outer sheath shall be resistant to abrasion, water, UV, and aliphatic hydrocarbons.

Outer sheath color:

In accordance with cables identification and service (See Section 6.4)

 NISOC	<p>نگهداشت و افزایش تولید میدان نفتی بینک</p> <p>سطح الارض و ابنیه تحت الارض</p> <p>عمومی و مشترک</p>								
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7.7 F&G SINGLE-TRIPLE WITH OVERALL SCREEN / MULTI- TRIPLE CABLES WITH INDIVIDUAL AND OVERALL SCREEN, RATED VOLTAGE 300/500 V

Cross section: 1.5/2.5 mm² (Depends to voltage drop calculation)

Application: For 24V D.C. Analogue Signals (gas detector, flame detector...)

Conductor: Tinned annealed 7-stranded copper in accordance with BS EN/IEC 60228.

Insulation: Fire Resistant type: Silicone rubber, Low smoke halogen free in accordance with IEC 60245-3 or Mica Glass Tape + XLPE, Low smoke halogen free in accordance with BS EN 50288-7.

Twinning: The insulated conductors shall be twisted together to form a pair, triple or quad. The lay length of a pair, triple or quad shall be in accordance with BS EN 50288-7.

Wrapping for individual screen: Each pair/triple/quad shall be wrapped with Polyester tape 0.023 mm Thick, helically wound with 25 % overlap.

Drain wire: Tinned annealed 7-stranded copper with a cross-section 0.5mm² as per BS PAS 5308.

Individual screen: Each pair/triple/quad shall be screened with aluminum backed Mylar tape helically applied with 25 % overlap. Aluminum on the inside to be in continuous contact with a bare drain wire. Thickness of screen shall be 0.008 mm aluminum on 0.010 mm Mylar tape as per BS PAS 5308.

Each screen shall be insulated from the remaining cable components by the application of suitable tapes and numbered in accordance with the pair numbering system.



Wrapping for overall screen:

The pairs, triples or quads shall be laid up to form a cable with a minimum of cross talk and wrapped with Polyester tape 0.023 mm Thick, helically wound with 25 % overlap.

Drain wire: Stranded tinned annealed copper wire with a cross-section 0.5mm² as per BS PAS 5308.

Overall screen: The pairs/triples/quads shall be screened with aluminum backed Mylar tape helically wrapped with a 25 % overlap. Aluminum on the Inside to be in continuous contact with a bare drain wire. Thickness of screen shall be 0.008 mm aluminum on 0.010 mm Mylar tape as per BS PAS 5308.

Wrapping below inner sheath:

 NISOC	<p>نگهداشت و افزایش تولید میدان نفتی بینک</p> <p>سطح الارض و ابنیه تحت الارض</p> <p>عمومی و مشترک</p>								
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The screened cable shall be wrapped with Polyester tape helically wound.

Inner sheath (Not applicable for non-armored cables):

Low smoke halogen free flame retardant compound in accordance with BS EN 50288-7.

Armor (Not applicable for non-armored cables): Galvanized round steel wire armor (SWA), having approx. 90% coverage, density and thickness in accordance with BS EN 50288-7.

Overall outer sheath:

Low smoke halogen free flame retardant compound in accordance with BS EN 50288-7.

The outer sheath shall be resistant to abrasion, water, UV, and aliphatic hydrocarbons.

Outer sheath color: In accordance with cables identification and service. (See Section 6.4)

7.8 F&G SINGLE-PAIR / MULTI-PAIR CABLES WITHOUT SCREEN, RATED VOLTAGE 600/1000 V

Cross Section: 2.5mm²

Application: For Discrete Signals (1 tone sounder/horn, flasher/beacon...)

Conductor: Tinned annealed 7-stranded copper in accordance with BS EN/IEC 60228.

Insulation: Fire Resistant type: Silicone rubber, Low smoke halogen free in accordance with IEC 60245-3 or Mica Glass Tape + XLPE, Low smoke halogen free in accordance with BS EN 50288-7.

Lay up: The cores shall be laid up to form a cable with a minimum of cross talk.

Wrapping below inner sheath: The cable shall be wrapped with Polyester tape helically wound.

Inner sheath (Not applicable for non-armored cables):



Low smoke halogen free flame retardant compound in accordance with IEC 60502-1.

Armor (Not applicable for non-armored cables):

Galvanized round steel wire armor (SWA), density and thickness in accordance with IEC 60502-1

Overall outer sheath:

Low smoke halogen free flame retardant compound in accordance with IEC 60502-1.

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک								
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	BK	GNRAL	PEDCO	000	IN	SP	0010	D02	

The outer sheath shall be resistant to abrasion, water, UV, and aliphatic hydrocarbons.

Outer sheath color:

In accordance with cables identification and service (See Section 6.4)

7.9 F&G SINGLE-TRIPLE / MULTI-TRIPLE CABLES WITHOUT SCREEN, RATED VOLTAGE 600/1000 V

Cross Section: 2.5mm²

Application: For Discrete Signals (2 tone sounder/horn ...)

Conductor: Tinned annealed 7-stranded copper in accordance with BS EN/IEC 60228.

Insulation:

Fire Resistant type: Silicone rubber, Low smoke halogen free in accordance with IEC 60245-3 or Mica Glass Tape + XLPE, Low smoke halogen free in accordance with BS EN 50288-7.

Lay up:

The cores shall be laid up to form a cable with a minimum of cross talk.

Wrapping below inner sheath:

The cable shall be wrapped with Polyester tape helically wound.

Inner sheath (Not applicable for non-armored cables):

Low smoke halogen free flame retardant compound in accordance with IEC 60502-1.

Armor (Not applicable for non-armored cables):

Galvanized round steel wire armor (SWA), density and thickness in accordance with IEC 60502-1

Overall outer sheath:

Low smoke halogen free flame retardant compound in accordance with IEC 60502-1.

The outer sheath shall be resistant to abrasion, water, UV, and aliphatic hydrocarbons.

Outer sheath color:

In accordance with cables identification and service (See Section 6.4)

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	BK	GNRAL	PEDCO	000	IN	SP	0010	D02	

8.0 ACCESSORIES

8.1 TRAYS AND CONDUITS

Cable Trays and associated accessories including tray covers shall be pre-fabricated type galvanized steel sheets

The nominal width of cable trays selected is 50, 100, 150, 300, 450 and 600 mm. The cable trays shall be supplied in standard length of 2500 mm.

Types of trays used are Perforated type, Ladder Type & Solid type.

The Flange height shall be considered for Ladder Type as 50 mm & for perforated & solid type trays as 100 mm.

The thickness for cable trays shall be considered 2 mm and the thickness for cable tray cover shall be considered 1.6 mm.

The maximum spacing between the rungs of the ladder type cable tray shall be considered as 250 mm.

Cable tray covers shall be provided for Perforated & solid type trays as indicated in the project drawings.

Accessories: The cable tray accessories are Vertical Elbows, Horizontal Bends, Adjustable Bends, Crosses, Tees and Reducers, etc,. All accessories shall have minimum bending radius of 600 mm.

Galvanizing: All cable trays, tray accessories, tray covers & tray supports including washers, etc. shall be hot dip galvanized. Should the galvanizing of the samples be found defective the entire batch of steel shall be regalvanized at BIDDER's cost.

Grounding conductors for Cable Trays 25 x 6 GS flat conductor shall run along the trays & interconnecting the trays at every 2.5 m intervals. 95 Sq.mm stranded copper conductor shall be used to grounding trays at minimum two points and in addition at 25 meters interval for longer length of trays

Manufacturer shall perform metrological / chemical composition and mechanical test on random samples of cable trays such as :

1. Visual inspection, dimensional checks and verification of bill of material as per approved drawings.
2. test for galvanizing to ensure that materials and workmanship to the relevant standards.
3. Zinc coating thickness test
4. Copper sulphate test (uniformity test).

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8.2 JUNCTION BOXES

Junction boxes shall generally be used with multi-conductor cables to reduce the number of cables.

The minimum ingress protection of junction box and cable glands shall be IP65.

Junction boxes shall be fabricated in 316 Stainless Steel or flame retardant Glass Fiber Reinforced Plastic, GRP.

Protection class of junction box shall be Eexe. Each junction box shall be sized with 20% spare terminals for the termination of spare conductors of the multi-conductor cable.

All Junction Boxes shall have external fixing lugs provided for installation. All Junction boxes shall be supplied with an internal/external earth stud for safety earth.

All junction boxes shall be supplied with an approved certificate and certification label attached to the lid.

All labels shall be securely affixed so as not to degrade IP rating of enclosure. Junction boxes shall be supplied, complete with certified screw terminals and links, assembled on terminal rails and terminals shall be labeled on both sides.

A junction box shall contain only signals of the same class. I.S. signal lines and non-I.S. signal lines shall not be contained in the same junction box. This rule shall be also applied for ESD signals, PCS signals, PSS Signals and F&G signals.

All Junction boxes shall be supplied pre-drilled with cable entries, suitable blanked off with certified plugs which shall be installed on spare connection.

All junction boxes shall be manufactured from stainless steel, with a finish suitable for the environment.

Protection class of cable glands shall be Eexd. It is preferable all single and multipairs cables enter into the junction box from bottom side of it.

8.3 SUPPORTS

Cable ladders shall be bolted to steel structures or walls and when necessary to suitable supports.

Fixing materials such as clamps, straps, fasteners, etc. shall be made of hot dipped galvanizes steel, or stainless steel, and shall be supplied by the vendor.

The bolts shall be stainless steel.

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support material shall be hot deep galvanized steel.

9.0 EARTHING CABLES, RATED VOLTAGE 450/750 V

Conductors: Tinned annealed stranded copper in accordance with BS EN/IEC 60228.

Number of Cores: one.

Outer sheath:

Low smoke halogen free flame retardant thermoplastic insulation in accordance with BS EN 50525-3-31.

Outer sheath color: In accordance with service (§6.3)

10.0 CONDUCTORS NUMBER

The number of pairs in signal cables shall be specified as follows:

A) Number of pairs, triples or quads:

1 pair/triple/quad,

2 pairs/triples/quads,

4 pairs/triples/quads,

7 pairs/triples/quads,

12 pairs/triples/quads,

19 pairs/triples/quads,

27 pairs/triples/quads

B) Number of cores:

1 Core,

2-Core

3-Core

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11.0 INSPECTIONS AND TESTING

11.1 GENERAL

The work shall be inspected in accordance with an approved procedure and quality plan. This shall include but not be limited to routine, sample and random tests, and critical inspection points.

11.2 TESTING

All cable types shall be subjected to type tests in accordance with the relevant IEC and/or BS standards.

All cables shall be subjected to routine tests by VENDOR before shipment in accordance with the relevant standard.

Routine tests shall be carried out on all cables produced and be in accordance with standards and norms. These tests shall be included:

- Continuity test, conductors, shields and armour
- Dielectric test
- Conductor and insulation resistance test
- Sample test shall be in accordance with standard and must be tested by:
 - Visual and dimensions inspection
 - Flame retardant test IEC 60332
 - Fire resistant test IEC 60331
 - Bending test for all cables



Random tests are to be performed on samples chosen on a random basis at the CLIENT's discretion limited to 10% of each type to prove fire resistance to IEC 60331, flame retardant to IEC 60332-Part I, HCL emission, limiting oxygen index and temperature index to the approved standards.

The Company reserves the right to attend and witness any tests on a discretionary basis.

12.0 DOCUMENTATION

Before start of manufacturing cables Vendor shall provide following items

- 1- Cable sample: When specified in the requisition, VENDOR shall provide CLIENT / EPC CONTRACTOR with a 300mm length of each type of cable, clearly marked with its Type No, to enable glands to be checked.
- 2- Cable Code Identification.

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The submission of drawings and data sheet shall be in accordance with the instructions contained in the Request for Quotation (RFQ) and Purchase Order (PO) for all items.

- Descriptive literature shall be provided.
- Sizes (Conduct. Diam., Insul. Thick, Core diam., Inner sheath thick and diam., Armour compos diam., Outer sheath thick, Outer diam. mini and maxi)
- Maximum lengths by drum, by cable type and weight drum.
- The VENDOR shall include the following information for each cable type:
 - a. Resistance at 35oC ohms/1000 meters
 - b. Inductance at 50 Hz in ohms/1000 meters
 - c. Capacitance at 50 Hz in microfarads /1000 meters
 - d. Weight in Kg/Km
 - e. Bending radius at minimum installation temperature
 - f. Minimum installation temperature

Cables list will be submitted by CONTRACTOR.

13.0 QUALITY ASSURANCE AND CONTROL

The appropriate part of ISO 9000: 1994 shall apply to work and a quality plan shall be produced which shall be subjected to approval prior to the commencement of production.

14.0 PACKING FOR SHIPMENT

The VENDOR shall be entirely responsible for the adequacy of the packing for shipment and storage on site.

Drums shall be encased to prevent damage. Packages shall not be shipped unprotected.

During loading the VENDOR shall witness the loading and bracing to satisfy himself that all reasonable precautions have been taken to prevent damage during transit.

Preparation for shipment and packing will be subject to inspection and rejection by CONTRACTOR'S inspectors. All costs occasioned by such rejection shall be to the account of the VENDOR.

Cables shall be drummed in maximum continuous lengths on non-returnable cable drums.

Cable ends shall be sealed and fixed to the drum. Cable drums shall be fitted with battens fixed around the entire periphery of the drum.

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All cable drums shall have their identification reference clearly stenciled on the outside of both flanges. Drum identification labels shall be attached on the outside and inside of the drum flange.

Drum identification labels shall be robust and non-fading.

15.0 PRESERVATION AND STORAGE

Cables shall be protected to withstand ocean transit and extended period of storage at the job site for a minimum period of 18 months.

Cables shall be protected to safeguard against all adverse environments, such as:

Humidity, moisture, rain, dust, dirt, sand, mud, salt air, salt spray, and sea water

All equipment and material shall be preserved and export packed in accordance with Project Preservation Specification.