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## طرح نگهداشت و افزایش تولید 27 مخزن

### SPECIFICATION FOR ELECTRICAL REQUIREMENTS OF PACKAGED UNITS

#### نگهداشت و افزایش تولید میدان نفتی بینک

D03	NOV. 2021	AFD	H.Shakiba	M.Fakharian	M.Mehrshad	
D02	SEP. 2021	IFA	H.Shakiba	M.Fakharian	Sh.Ghalikar	
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Class: 2

Company Doc. Number:

Status:

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 Company 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.



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

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## 2.0 SCOPE

This supply specification gives the minimum technical requirements for design, construction and testing of all electrical equipment and materials supplied as part of the packaged units.

Only the general requirements are given in this specification. The specific requirements of individual cases will be given in Data sheet and request for quotation and/or purchase order.

Electrical requirements that may be included in the specifications of individual mechanical package shall be added to the requirements of this specification.

All deviations from this specification shall be submitted in writing to purchaser, together with his quotation, in order purchaser may approve or reject the deviations. Vendor shall not proceed with any such deviations prior to receiving purchaser's written approval.

Vendor shall not carry out any testing or pre commissioning of equipment or bulk items without submitting prior notification to purchaser. Purchaser reserves the right to witness all testing and pre commissioning.

The term "Data Sheets" as used in this specification refers to the necessary drawings, tabulations, sketches, etc., that the vendor must submit with an inquiry or purchase order to clearly indicate the technical, electrical and physical requirements of the complete equipment.

All equipment for installation in hazardous area shall be certified by an approved testing authority.

## 3.0 NORMATIVE REFERENCES

### 3.1 Local Codes and Standards

IPS-E-EL-100(1)	Electrical System Design (Industrial and Non-Industrial)
IPS-E-EL-110(2)	Engineering Standard for Hazardous Area
IPS-C-EL-115(1)	Construction Standards for Electric Installation
IPS-M-EL-271(2)	Low Voltage Cables and Wire
IPS-M-EL-131(2)	Low Voltage Induction Motors
IPS-M-EL-161(2)	General Electrical Items
IPS-M-EL-143(3)	Low Voltage Switchgear

### 3.2 International Codes and Standards

IEC 60034	Rotating Electrical Machines Part 1: Rating and Performance
IEC 60072-02	Dimensions and output ratings for rotating electrical machines
IEC 60079-7-07	Electrical Apparatus for Explosive Gas Atmospheres part7
IEC 60269-04	LV Voltage Fuses Part1: General Requirements

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IEC 60292	LV motor starters
IEC 60364-11	Electrical installations of buildings
IEC 60947-4-1	Low-voltage switchgear and control gear, Part 4-1: Contactors and motor starters – Electromechanical contactors and motor starters (Amendment 2)
IEC 60439-04	Low-Voltage Switchgear and Controlgear Assemblies, Part 1: Type-Tested and Partially Type-Tested Assemblies
IEC 60529-02	Degrees of protection provided by enclosures
IEC 60228-11	Conductors of insulated cables
IEC 60287-11	Electric cables – Calculation of current rating, PART 1-1: Current Rating Equations (100% Load Factor) And Calculation of Losses
IEC 60408	Low-voltage air-break switches, air-break disconnectors and fuse combination units
IEC 60027-05	Letter symbols to be used in electrical technology, Part1
IEC 60445-10	Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals and terminations of certain conductors, including general rules for alphanumeric system
IEC 60947-5-1	Low-voltage switchgear and control gear, Part 5-1: Control circuit devices and switching elements – electromechanical control circuit devices
IEC 60947-2-05	Low-Voltage Switchgear and Control gear: part 2 Circuit- Breakers
IEC 60423-08	Conduits for Electrical Purposes- Outside Diameters of Conduits for Electrical Installations and Threads for Conduits and Fittings
IEC 61293	Marking of electrical equipment with Rating related to Electrical Supply – Safety requirement
API PR 505	Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class1, Zone 0, Zone 1, Zone 2
API PR 540	Electrical Installations in Petroleum Processing Plants

### 3.3 Project Documents

BK- GNRAL-PEDCO -000-EL-DC-0001

Electrical System Design Criteria

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### 3.4 Environmental Data

The installation site is in south of Iran with corrosive, hot and high humid atmosphere. Therefore, all equipment shall be designed to fully comply with the performance specification in the environmental conditions. For more information refer to "Process Basis Design; section 11".

For the Ambient Conditions, Special Care should be paid to:

- Enclosures of Equipment for Outdoor Installation
- Painting and Coating of Metal Parts to Resist to the Severe Environmental Conditions

Any environmental derating factors shall be considered by vendor before design.

### 3.5 Order of Precedence

In case of conflict between requirements specified herein & the requirements of any other referenced document, the most approved stringent requirements of below listed items shall be considered based on the approval given by the owner's representative:

Purchase order

Material Requisition

MTO & Data Sheet

This Specification

Drawing & Other Specification

Reference Project Specification

Iranian Petroleum Standard (IPS)

Reference international Code & Standards

When the term "Authorized", Authorization", "Approval", or "Approved" are used in this specification, it shall mean authorization or Approval from OWNER.

In case of any conflict between the project documents, the most stringent one shall be considered.

## 4.0 UNITS

All electrical documentation, drawings, data, etc. shall be in English and SI metric system of measurement shall be used.

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## 5.0 ELECTRICAL DESIGN REQUIREMENTS

### 5.1 Area Classification

All equipment and wirings in hazardous area must comply with IEC and European standard requirements.

Electrical equipment and materials for installation in hazardous areas shall be labeled, listed, certified, accepted and/or otherwise determined to be safe by one of the officially accepted testing authorities, listed below for full compliance with safety requirements in classified areas.

UL: Under writer's laboratories (USA)

BASEEFA: British approvals services for electrical equipment for flammable apparatus (UK)

PTB: Physikalischtechnischebundesanstalt (GERMANY)

ASTA: Association of Short Circuit Testing Authorities

EOTC: European organization for testing & confirmation

It is the vendor's responsibility to make sure that electrical equipment, materials and associated wiring and cabling within their supply conform to the requirements for the specified area in which the equipment shall operate.

For classified areas and type of protection refer to the relevant data sheet for area classification and type of equipment protection.

### 5.2 Power Supply System

The available line voltages and frequency of the power supply which may feed the package unit are as follows:

- 1) 400 V, 3 phase & neutral, 50 Hz (with separate earthing conductor in accordance with system TN-S), 50 Hz. The neutral conductor of LV network will be solidly grounded at the transformer secondary.
- 2) 230 V, 1 phase & neutral, 50 Hz, (with separate earthing conductor in accordance with system TN-S).

If other voltages are required, transformation and conversion equipment shall be furnished with the package equipment.

Electrical system shall be designed for variations as follows:

- AC supply voltage  $\pm 10\%$
- AC supply frequency  $\pm 5\%$
- DC voltage  $\pm 5\%$

400V and 230V system neutral shall be solidly earthed.



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### 5.3 General Requirements

The vendor shall supply, install and wire electrical equipment, enclosures, devices, wiring and cabling within his package compatible with the equipment location (indoor or outdoor), corrosive and potentially explosive environment. Local skid mounted starter/control panel and station shall be provided by the vendor.

The vendor shall provide identification of terminals, wiring, cabling, equipment, panels, and junction boxes for the purchaser's cable connections.

The vendor shall carry out the tests as defined in section 6.0 of this specification.

The packaged unit shall be designed to minimize the risk of short circuit and to ensure personnel and operational safety during all operating conditions, inspection and maintenance while the packaged unit is in operation.

Conductors shall be suitably sized to continuously carry the maximum expected currents of the rated service, and packaged unit shall be capable of continuous operation at full load under site condition.

Packaged units and all its components shall be able to withstand the thermal and dynamic stresses resulting from the prospective short circuit currents as specified, without any injury to personnel.

### 5.4 Construction

#### 5.4.1 Panels

Locally mounted control panels shall be supplied by the vendor completely prewired to terminal blocks at the bottom of the panel (for bottom entry).

The panels shall have a complete enclosure of sheet steel and suitable for the location at the site condition.

The panels shall contain all control items to operate the equipment such as circuit breakers contractors, relays, transformers and conversion units. Pushbutton switches, measuring device, instruments, indicators, etc., shall also be included in the panels.

Terminal blocks shall be of the locking type construction to prevent wires from becoming loose. All terminals shall be nickel plated, shall accept only one wire per terminal and be arranged within the panel to accommodate purchases incoming cables.

Outdoor local panels shall have a rain canopy with fluorescent lights underneath the canopy. Light control switch with relevant wiring to the lighting fixture shall be considered.

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Panels shall have appropriate disconnecting device for each incoming supply and sub-circuit where necessary.

Incoming supply disconnecting device shall de-energize and isolate all wires, including the neutral, simultaneously.

Outdoor use and flame proof construction panel boards shall be provided with gland plate and cable glands for cable entries. The thread shall be metric (BS 3643).

Cabinets and compartments which have to be accessible during normal operation shall contain no exposed live parts under normal operational conditions.

All panels must be vermin and rodent proof and fully tropicalized.

Insulation materials used for the enclosures shall have non fire propagating properties.

All bolted and screwed connections shall be of a non-loosening type.

The enclosures shall conform to IEC 60298 with regard to their mechanical strength in the event of an internal arc. Test performance shall be in conformity with IEC 60298.

Suitable removable lifting eyes shall be provided on the top of all panels.

#### 5.4.2 Motor Starters:

Motor starters shall be a combination type having rotary switch and fuses and magnetic contactor with thermal overload relay.

For motor starter units with rating of 18.5 kW and above, earth fault relay & phase control (27/47) shall be used.

Motor starters shall be supplied by the package vendor and shall be installed in suitable enclosures.

Motor starters shall be of the air break direct on-line starting type.

The motor starters shall comply with the requirement of IEC 60947-4-1 when supplied with the package unit.

Motor starters for continuous operation shall be designed for AC3 duty and coordination type C, as per IEC 60947-4-1.

Single phasing protection shall be provided for the main bus bars of the local distribution panel.

Starters for major electric motors of the package unit will be located outside the skid in the MCC of the relevant substation.

Single-phase and fractional-horsepower three-phase motors will have the relevant starters in the local power distribution panel on the skid.

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#### 5.4.3 Circuit Breakers and On-Load Switches:

Circuit breakers used in power circuits shall conform to IEC publication 60947-2. They shall have a making and breaking capacity equal to or higher than those specified for the main power supply equipment.

On-load switches shall be capable of interrupting and closing the circuits rated current and withstand without damage, the short circuit current, for the full clearance time of the upstream protective devices.

Fuses must comply with IEC publication 60269-2 for industrial installation.

#### 5.4.4 Control System:

Alarm and signaling circuits shall be fail safe, with normally close contacts opening to alarm.

Indicating ammeter shall be provided for each motor 4 kW and above. For motors less than 4 kW, ammeters will be provided if required for process purpose.

Control voltage of each motor starter shall be supplied from an AC control voltage transformer at 230V through a suitably rated fuse.

Voltage free contacts shall be provided for motor/breaker status indication.

Indicating lamps shall be arranged for easy replacement from the panel front. Lamp glasses shall have a standard color.

The color of lamp shall be as follows:

CB close and/or running: red.

CB open and/or stop: green.

Fault trip: amber.

Power source and/or test: white

All compartment doors shall be interlocked to prevent opening when the isolating device is in "ON" position.

#### 5.4.5 Motors

Motors and their enclosures shall conform to LV & MV motors specification. All motor control stations, safety switches, control panels and junction boxes shall be correctly positioned on the skid to prevent accidental damage. All motor stop pushbuttons shall be "push to stop and turn and pull to reset" type and shall be guarded against accidental operation.

#### 5.4.6 Protection Degree

The protection degree of the enclosures based on the location shall be as follows:

- Outdoor (safe area under canopy) min. IP55

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- Outdoor (hazardous area and safe area without canopy) min. IP65
- Indoor (safe Area) IP42
- Indoor (Hazardous area) IP65

#### 5.4.7 Terminal and Junction Boxes

Terminal and junction boxes shall be made of cast iron or enclosure material shall be cast iron or copper-free aluminum. The requirements for terminal blocks within the boxes are the same as those specified for panels in section 5.4.

#### 5.4.8 Current and Voltage Transformer

Current and voltage transformers and their connections shall comply with IEC 60044 and IEC 60186 respectively.

#### 5.4.9 Protective Relays

All relays shall be equipped with visible flag indicators or other means of indication relays shall have manual reset facilities and shall not be sensitive to vibration, shocks or transients. Relays shall be able to withstand the short circuit level of the relevant current transformer. Contact rating and performance shall be in accordance with IEC 60255.

#### 5.4.10 Cable Tray

Cable trays, supports and relevant materials shall be made of hot dip galvanized steel. Cable trays shall have removable covers in locations where cables are subject to damage from falling objects or corrosive liquids.

Process piping and equipment and handrails shall not be used to support cable trays.

#### 5.4.11 Interchangeability

Identical electrical components shall be of one type and withdraw able subassemblies containing one or more components with identical function and capacities shall be mechanically interchangeable.

### 5.5 Cabling

All interconnecting cables for completing the package shall be prefabricated at the package vendor's shop. All connection material cable supporting system and clamping shall be supplied by the vendor.

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Vendor shall provide the proper cable route for the outgoing cables within the package including cable supports, conduits and cable trays.

The cable entries shall be water and/or gas tight and use cable glands of proper size. Cables shall be protected from stress at termination by using tie wrap, at a distance of 100 mm from the cable gland to the offset strip spare and unused glands shall be properly plugged or sealed.

When cable glands and cables are mounted, the glands and cables shall be sealed with a 0.15m long black colored shrink sleeve (sleeve type glue filled).

Cable entry holes shall be provided for all spare circuits. Holes shall be plugged with stopping plugs.

The minimum conductor size for low-voltage power wiring shall be 2.5 sqmm copper. Terminals shall be accessible from the front of the panel.

Wiring for external connections shall be brought to suitable terminal enclosures at the package skid limits.

## 5.6 Internal Wiring & Termination

All wiring shall be continuous from terminal to terminal with no splicing. Wiring shall be stranded copper conductor with flame retardant insulation. The size and type shall be selected on current carrying capacity, voltage and mechanical strength.

Color code shall be in accordance with IEC.

The wiring numbers shall correspond to the schematic diagram fronded by vendor.

Wires shall be identified at both ends. The marking shall be in accordance with the marking method in IEC. The terminals of outgoing interface cables for instrument power supply system shall be provided with the separate terminal boxes.

A minimum of 10% spare terminals for control shall be provided in each panel.

## 5.7 Earthing

All metallic non-current carrying parts, that are not inherently grounded, shall be bonded together and to the external grounding system. Hinged doors shall be effectively grounded through a flexible connection.

Suitable earthing shall be installed for safety of personnel and protection against static electricity Metallic non-current carrying parts of all major electrical equipment shall be earthed by suitable connection to the skid, frame, or steel platform.

Where equipment earthing jumpers are not bare copper, color of the insulation shall be yellow/green.

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All electrical joints made for earthing shall be accessible.

Two earth bars to which equipment earthing is connected shall be provided at opposite end of the skid. The earth bars shall be provided with bolt and washer to accommodate purchaser's external earth connection to the main earthing grid.

### 5.8 Lighting

The package Suppliers shall provide luminaries when necessary.

The luminaries shall be of the types specified by the Contractor.

Where the package Supplier is of the opinion that the Contractor's luminaries are not suitable for the particular application, the Supplier shall offer alternative luminaries for the Contractor's approval stating:

- The type of luminaries
- Certification details as applicable
- Application
- Reason for non-acceptability of Contractor's specified luminaries
- IP degree of protection

Appropriate level of illumination shall be provided for the skid and the local control panels, in accordance with API RP 540.

The Supplier shall submit a lighting scheme for Contractor.

### 5.9 Power Factor

Electrical equipment in the package unit shall operate at 0.85 to 0.9 power factors at normal operating conditions.

The power factor shall be compensated to 0.95, in case the power factor is less than 0.9. The Supplier shall advise the type and size of power factor compensators to be used in this case.

### 5.10 Labels and Marking

Labels shall be made according to site condition. Description shall be in English language. Adhesive or enameled plates are not acceptable.

Name plate on the outside of the enclosure shall indicate purchase order numbers, the year of manufacture, the name of the manufacturer, the type and serial number of the equipment, etc.

For all items of equipment, engraved nameplates shall be provided in accordance to IEC regulations.

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### 5.11 Painting

The painting system shall be suitable for site condition and adequately protect all structural work and the equipment against corrosion.

The painting system and finish color shall be submitted to the purchaser for approval prior to manufacturing.

Vendor shall supply paint taken from the same batch as factory paint for touching up after installation. Two one-paint aerosol spray cans of each color per assembly shall be supplied.

### 5.12 Accessories

All the accessories and spare parts required for handling, erection, testing and monitoring shall be supplied by vendor.

As a minimum, the following shall be provided:

- Devices needed for handling during transportation, loading, unloading, erection, etc.
- Special tools for installation, erection and maintenance.
- Devices required for monitoring and testing

## 6.0 INSPECTION AND TESTING

The purchaser's inspector or his authorized representative shall have free access to the manufacturing plant engaged in the manufacture of the equipment, to carryout necessary inspection at any stage of work.

The vendor shall make available technical data, test pieces and samples that the purchaser's representative may require for verification in conjunction with pertinent equipment. If required the vendor shall forward the same to any person or location that the purchaser's representative may direct.

The vendor shall maintain appropriate inspection and test records to substantiate conformance with specified requirements.

Quality records shall be legible and relevant to the product involved.

Test procedure as proposed by the vendor shall be agreed upon, and approved by the purchaser before any test is carried out.

The test shall be done in accordance with IEC recommendations.

Approval by the purchaser's inspector or representative shall not relieve the vendor of his commitments under the terms of this specification or any associated order.



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## 7.0 PREPARATION FOR SHIPMENT

Preparation for shipment shall be in accordance with manufacturer's standards, unless otherwise noted on the request for quotation and/or purchase order.

The vendor shall be solely responsible for the adequacy of the preparation for shipment employed with respect to materials and application, and provide materials to their destination in ex-works condition when handled by commercial carrier systems.

All parts shall have identification tags specifying main equipment, item number and drawing reference.

One complete set of the installation, operation and maintenance instructions shall be packed in boxes or crates with the equipment.

## 8.0 SPARE PARTS AND SPECIAL TOOLS

Spare parts of electrical components shall be interchangeable, as far as practical, between different electrical components, and shall be suitable for use in place of the original parts & comply with the same specification & tests.

Spare parts shall be marked and numbered for easy identification, and preserved against damage & deterioration during transport and storage.

Adequate quantity of commissioning spare parts shall be provided for all electrical components of the package unit.

At the quotation stage the following lists of parts and tools shall be submitted by the Supplier:

- 1) Commissioning spare parts
- 2) Spares for 2-year operation
- 3) Special tools

Supplier shall provide any special tools required for the operation and maintenance of package unit electrical equipment.