**Hellenic Gas Transmission System Operator S.A.**
357-359 Messogion Av., GR 152 31 Halandri
Tel.: 213 088 4000
Fax: 210 674 9504
Email: desfa@desfa.gr

**TECHNICAL SPECIFICATION**



## HIGH PRESSURE (HP) TRANSMISSION SYSTEMS

# ELECTRICAL MATERIAL SUPPLIED WITH PACKAGED UNITS

JUNE 2021



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# 1. INTRODUCTION

# 2. SCOPE AND OBJECTIVES

This specification shall apply to electrical machinery equipment and materials supplied by equipment Vendors/Manufacturers as part of packaged units, (i.e., compressor equipment, special pump equipment, boilers, fired heaters, refrigeration units, and in general skid-mounted, prefabricated and preassembled units).

Electrical materials for package units may comprise motors, stop/start units, supply distribution units, electrical instrument panels and instrument devices, (i.e.: level switches, pressure switches, temperature switches, cabling and connections), lighting fixtures and circuits etc.

# 3. REFERENCES

## 3.1 Reference Documents

## 3.2 Reference Codes and Standards

| | |
|---|---|
| 2014/34/EU | Equipment Explosive Atmospheres Directive |
| 2014/35/EU | Low Voltage Directive |
| 2014/30/EU | Electromagnetic Compatibility Directive |
| MINISTERIAL DECISION 50/12081/642/2006 F A – GG B / 1222/5.9.2006 | Security Home Electrical Installations (E.I.E.). Introduction of a Differential Current Installation of Construction and Fundamental Grounding |
| ELOT EN 1594 E3 | Gas Supply Systems. Pipelines for Maximum Operating Pressure over 16 bar. Functional Requirements |
| ELOT EN 14161+A1 | Petroleum and Natural Gas Industries. Pipeline Transportation Systems |

BS EN 62561-1:2017 Lightning protection system components (LPSC). Requirements for connection components

BS EN 62561-2:2012 Lightning Protection System Components (LPSC). Requirements for conductors and earth electrodes

BS EN 62561-3:2017 Lightning protection system components (LPSC). Requirements for isolating spark gaps (ISG)

BS EN 62561-4:2017 Lightning protection system components (LPSC). Requirements for conductor fasteners

BS EN 62561-5:2017 Lightning protection system components (LPSC). Requirements for earth electrode inspection housings and earth electrode seals

BS EN IEC 62561-6:2018 Lightning protection system components (LPSC). Requirements for lightning strike counters (LSC)

BS EN IEC 62561-7:2018 Lightning protection system components (LPSC). Requirements for earthing enhancing compounds

ELOT EN IEC 60079-0 E5 Electrical Apparatus for Explosive Gas Atmospheres - Part 0: General Requirements

ELOT EN 60079-7 E3 Electrical Apparatus for Explosive Gas Atmospheres - Part 7: Increased safety e

ELOT EN 60079-10-1 E2 Electrical Apparatus for Explosive Gas Atmospheres – Part 10: Classification of Hazardous Areas

ELOT EN 60099-4 E3 Surge Arresters - Metal Oxide Surge Arresters without Gaps for A.C. Systems

ELOT EN IEC 60099-5 E3 Surge Arresters - Selection & Application Recommendations

ELOT EN 62305-1 E2 Protection against Lightning, Part 1: General Principles

ELOT EN 62305-2 E2 Protection against Lightning, Part 2: Risk Management

ELOT EN 62305-3 E3 Protection against Lightning, Physical Damage to Structures and Life Hazard

ELOT EN 62305-4 E4 Protection against Lightning, Part 4: Electrical and Electronic Systems within Structures

| | |
|---|---|
| ELOT EN ISO 9001 E4 | Quality Management Systems |
| ELOT EN ISO/IEC 17025 E3 | General Requirements for the Competence of Testing and Calibration Laboratories |
| ELOT HD 384 | Requirements for Electrical Installations |
| ELOT HD 60364 | Electrical Installations of Buildings |
| EN 61000 | Electromagnetic compatibility (EMC) |
| EN 61643-11 | Low Voltage Surge Protective Devices – Part 11: SPDs Connected to Low Voltage Power Distribution Systems – Performance Requirements and Testing Methods |
| EN 61643-21 | Low Voltage Surge Protective Devices – Part 22: SPDs Connected to Telecommunication and Signaling Networks – Performance Requirements and Testing Methods |
| IEC 60664 | Insulation Coordination for Equipment within Low-Voltage Systems |
| IEC 61643-12 | Low Voltage Surge Protective Devices – Part 12: SPDs Connected to Low Voltage Power Distribution Systems – Selection and Application Principles |
| IEC 61643-22 | Low Voltage Surge Protective Devices – Part 22: SPDs Connected to Telecommunication and Signaling Networks – Selection and Application Principles |
| IEC 62548 | Design Requirements for Photovoltaic (PV) Arrays |
| IEC 62561-1 | Lightning Protection Components (LPC), Part 1: Requirements for Connection Components |
| IEC 62561-2 | Lightning Protection Components (LPC), Part 2: Requirements for Conductors and Earth Electrodes |
| IEC 62561-3 | Lightning Protection Components (LPC), Part 3: Requirements for Isolating Spark Gaps |
| IEC 62561-4 | Lightning Protection Components (LPC), Part 4: Requirements for Conductor Fasteners |

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| IEC 62561-5 | Lightning Protection Components (LPC), Part 5: Requirements for Earth Electrode Inspection Housings and Earth Electrode Seals |
| IEC 62561-6 | Lightning Protection Components (LPC), Part 6: Requirements for Lightning Strike Counters |
| IEC 62561-7 | Lightning Protection Components (LPC), Part 7: Requirements for Earthing Enhancing Compounds |
| ELOT EN 60071-1 | Insulation Coordination – Definitions, Principles & Rules |
| ELOT EN 60071-2 | Insulation Coordination – Application Guide |
| EN 60664-1 | Insulation Coordination for equipment within Low Voltage Systems |
| IEC 61643-11 | Low-voltage surge protective devices - Part 11: Surge protective devices connected to low-voltage power distribution systems - Requirements and tests |

## 4. ACRONYMS

| | |
|---|---|
| AC | Alternating Current |
| API | American Petroleum Institute |
| ASME | American Society of Mechanical Engineers |
| ATEX | ATmosphères EXplosibles (Explosive Atmospheres) |
| ATS | Automatic Transfer System |
| BMS | Building Management System |
| BVS | Block Valve Station |
| BCC | Back-up Control Centre at Nea Messimvria |
| CCTV | Closed Circuit Television System |
| CPR | Construction Products Regulation |
| CP | Cathodic Protection |
| CPU | Central Processor Unit |
| CS | Compressor Station |
| DB | Distribution Board |

| | |
|---|---|
| DC | Direct current |
| DCS | Distributed Control System |
| DEG | Detailed Engineering |
| DIN | Deutsches Institut für Normung (German Institute of Standardization) |
| DVA | Digital Voice Announcer |
| DVD | Digital Video Disc |
| EDG | Emergency Diesel Generator |
| ELOT | Hellenic Organization for Standardization |
| ELV | Extra Low Voltage (nominal voltage not exceeding 50 V AC or 120 V DC (ripple-free) between conductors or to earth, as defined by the Standard EN 61558) |
| EN | European Norms |
| EPC | Engineering, Procurement and Construction |
| EU | European Union |
| ESD | Emergency Shut Down |
| F&G | Fire and Gas |
| FACP | Fire Alarm Central Control Panel |
| FARP | Fire Alarm Repeater Control Panel |
| FAT | Factory Acceptance Test |
| FEG | Field Engineering |
| FC | Floe Computer |
| FOC | Fibre Optic Cable |
| GCC | Gas Control Centre at Patima |
| HEDNO | Hellenic Electricity Distribution Network Operator |
| HDPE | High Density Polyethylene |
| HMI | Human Machine Interface |
| HVAC | Heating Ventilation Air Conditioning |
| I/O | Input / Output |
| IEC | International Electrotechnical Commission |
| ISO | International Organization for Standarization |

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|---|---|
| ITU | International Telecommunication Union |
| LAN | Local Area Network |
| LCS | Local Control System |
| LED | Light Emitting Diode |
| LFEP | Local Fire Detection & Fire Extinguishing Panel |
| LV | Low Voltage |
| LSP | Load Share Panel |
| MSC/MCS/SMC | Main Station Controller |
| MV | Medium Voltage |
| MPS | Master Project Schedule |
| MPR | Monthly Progress Report |
| NFPA | National Fire Protection Association |
| NNGTS | National Natural Gas Transmission System |
| NTSC | National Television System Committee |
| O&M | Operation and Maintenance |
| PID | Piping and Instrumentation Diagram |
| PA/GA | Public Address / General Alarm |
| PCS | Process Control System |
| PED | Pressure Equipment Directive |
| PEP | Project Execution Plan |
| PFD | Process Flow Diagram |
| PLC | Programmable Logic Controller |
| PMS | Power Management System |
| POC | Project Organization Chart |
| PAL | Phase Alternate Line |
| PPC | Public Power Corporation |
| PTZ | Pan, Tilt, Zoom |
| PVC | Poly Vinyl Chloride |
| QA | Quality Assurance |
| RCC | Remote Communications and Controls |
| RFI | Radio Frequency Interference |

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|---|---|
| RTD | Resistance Temperature Detectors |
| RTU | Remote terminal Unit |
| S/S | Scraper Station |
| SAT | Site Acceptance Test |
| SCADA | Supervisory Control and Data Acquisition (including Telemetry) |
| SCS | Station Control System |
| SFP | Small Form-factor Pluggable |
| SPD | Surge Protection Device |
| SPL | Sound Pressure Level |
| UDP | User Datagram Protocol |
| UPS | Uninterruptible Power Supply |
| UV | Ultraviolet |
| VGA | Video Graphics Array |
| VMS | Video Management Software |

# 5. GENERAL

This specification for requirements for electrical machinery, equipment and materials forming part of electrical or non-electrical package units (PU).

This specification is to be complied with by Vendor / Manufacturer, when submitting quotation for package equipment including any type of electrical materials.

This specification shall be an integral part of the inquiry and of purchase order, which include the Material Requisition and appropriate specifications, drawings etc., and shall be read in conjunction with the Specification "General Notes for Electrical Equipment and Materials".

Bids and/or order confirmations issued by Manufacturer / Vendor of packaged equipment (PU) shall bear the following statement, referring to the electrical equipment.

THIS BID/ORDER CONFIRMATION IS FULLY IN ACCORDANCE WITH THE DOCUMENTS ISSUED BY CONSULTANT/OWNER, EXCEPT WHAT SPECIFIED UNDER THE HEADING: EXCEPTIONS

IN THE ABSENCE OF THIS STATEMENT, IT SHALL BE ASSUMED THAT QUOTATION AND/OR ORDER CONFIRMATION IS STRICTLY IN ACCORDANCE WITH CONSULTANT'S/OWNER'S DOCUMENTS.
THE SAME STATEMENT APPLIES ALSO TO THE REQUIRED DELIVERY CONDITIONS OF DRAWINGS AND DOCUMENTS.

## 6. CODES AND STANDARDS

The design and installation of materials shall conform to the requirements of the latest edition of the standards called for in the material requisition and documents attached to it.
Standards considered in general for the project are listed on Table "B" (*).
(*) Tables "A" to "F" mentioned in this specification form part of the specification “General Notes for Electrical Equipment and Materials”.

## 7. CLASSIFICATION OF ENVIRONMENTS AND HAZARDOUS-LOCATIONS

In general, unless otherwise specified in the material requisition and attached documents the following classification shall apply.
The environmental conditions shall be classified as follows: outdoor installation, protected outdoor installation, indoor installation in dry location, pressurized rooms and non-pressurized rooms.
The hazardous locations shall be classified as per ELOT EN 60079-10-1 E2.

## 8. SELECTION OF MATERIAL, EQUIPMENT AND MACHINERY IN RELATION TO THE CLASSIFICATION OF ENVIRONMENT AND OF HAZARDOUS LOCATION

Technical documents will specify the environmental conditions and the classification of the location in which equipment is to operate.

It is Manufacturer / Vendor's responsibility to ensure that all electrical materials and installation within their supply conform to the conditions in which the equipment is to operate.
When operating in a hazardous location the electrical equipment shall also be certified by an internationally or nationally recognized testing institute, as specified in TABLE "B"(*).
Enclosures and type of protection of materials and type of installation shall be selected in accordance with ELOT EN 60529.
Requirements of TABLE "G" are the minimum.
Other solutions may be considered by Manufacturer / Vendor, provided Contractor's approval.

# 9. DESIGN

Unless otherwise specified in the material requisition and in attached documents, the following information shall be considered for the design.

## 9.1 Design Ambient Temperature for Electrical Equipment

Site conditions and design temperature are indicated on TABLE "C"(*).

## 9.2 System Voltages

System voltages are as shown on TABLE "A"(*).

## 9.3 Short Circuit Levels

Manufacturer / Vendor shall consider that at the supply point the short circuit levels specified on TABLE "A"(*) exist in the plant (symmetrical initial values).
If equipment supplied by Manufacturer/Vendor is not suitable, adequate protection shall be provided by Manufacturer/Vendor.
Method of protection to be stated by Manufacturer/Vendor.

(*) Tables "A" to "F" mentioned in this specification form part of the specification “General Notes for Electrical Equipment and Materials”.

## 9.4 Motors

Supply voltage of motors shall be as indicated in Table "A"(*).

## 9.5 Motor Starters and Control Equipment

Motors starter (i.e.) circuit breakers or contactors shall be generally provided by Owner and are not included in Manufacturer/Vendor's supply.
Exceptions with Consultant's, Owner's approval.
All devices on the package units for motor control (i.e. push buttons, selector switches, and auxiliary devices) shall be provided by Manufacturer / Vendor.

## 9.6 Wiring

All electrical equipment shall be wired to terminal boxes placed in easily accessible positions. All wiring shall be always mechanically protected.

## 9.7 Earthing

Electrical equipment shall be provided with suitable terminal studs for earthing, suitable sized for thermal and mechanical stresses.
Earthing of metallic masses and bonding shall also be provided.

## 9.8 Lighting

No general lighting shall be included in package units by the Manufacturer / Vendor. Any specific area requiring illumination by Owner shall be stated by the Manufacturer / Vendor.

### 9.9 Weather-Proofing

Electrical equipment located outdoor shall be with the required degree of protection (see TABLE "G").

If necessary, adequate covers, in form of fabricated shelters against rain and solar radiation, shall be provided.

### 9.10 Interconnecting Wiring and Associated Glands

Interconnecting wiring between individual units and the terminal boxes shall be supplied by Manufacturer / Vendor.

For connection external to the terminal boxes, Manufacturer / Vendor shall specify type and size of cables to be used.

Manufacturer / Vendor shall provide suitable cable trays or cable conduits to permit the interconnecting wiring of the single electric apparatus mounted on package units up to the side agreed with Consultant's / Owner, for the approach with the electrical substation or with other plant.

### 9.11 Control Criteria

Unless otherwise specified, the control criteria of the entire package units shall be such as to prevent automatic reenergization after voltage recovery following a voltage failure: Failure to safety scheme shall be adopted. Exceptions may be accepted only with Consultant's / Owner approval.

(*) Tables "A" to "F" mentioned in this specification form part of the specification “General Notes for Electrical Equipment and Materials”.

## 10. STANDARDIZATION OF EQUIPMENT AND MATERIALS

Unless otherwise specified in the Material Requisition, it is recommended that equipment and materials not manufactured by Manufacturer/Vendor, for uniformity reasons and for spare parts problems, shall be of the same type and manufacture for the whole supply.

A list of Sub-Vendors shall be submitted for Consultant's / Owner approval.

Use of Asbestos or of any asbestos-containing product is absolutely prohibited.

## 11. MOUNTING AND ERECTION

Electrical package units shall be furnished by the package units Manufacturer / Vendor completely mounted, assembled and wired.

Manufacturer / Vendor shall inform if parts or components of the package units will be furnished loose or will required erection work at job site.

The package unit’s layout shall be submitted to Consultant's / Owner's for approval, to define the exact location for the electrical power auxiliary, lighting and earthing conductors’ approach from the electrical substation or other plant.

## 12. BATTERY LIMITS

If the package units are furnished skid-mounted, each single skid shall have on one side, a suitable terminal box for the connection of the electrical wires to the adjacent skid.

For the earthing system, copper bars suitable to connect the skid earthing system to the adjacent skid, shall be mounted on the two opposite sides.

For motors, the battery limit shall be the terminal box.

## TABLE "G"

## SELECTION OF ENCLOSURES AND TYPE FOR PROTECTION

| CLASSIFICATION OF ENVIRONMENTS | Rotating Machines | Sparking Equipment | Lighting Fixtures | Wiring Fittings | Canalization type |
|---|---|---|---|---|---|
| Outdoor | IP 65 | IP 65 | IP 65 | IP 65 | Armoured cables underground or in trays or ladders. |
| Protected Outdoor | IP 65 | IP 65 | IP 65 | IP 65 | Armoured cables underground or in trays or ladders. |
| Indoor Installation | IP 55 | Low Voltage IP 31<br>High Voltage IP 31 | IP 31 | IP 31 | Armoured cables underground or in trays or ladders. |
| CLASSIFICATION OF HAZARDOUS LOCATIONS | | | | | |
| Class 1, Division 0 | — | — | — | — | Armoured cables underground or in trays or ladders. |
| Class 1, Division 1 | EEx-d or EEx-e or EEx-p | EEx-d or EEx-ib or EEx-p | EEx-d or EEx-e | EEx-d or EEx-e | Armoured cables underground or in trays or ladders. |
| Class 1, Division 2 | EEx-n or EEx-e | EEx-d or EEx-ib or EEx-p | EEx-d or EEx-e or EEx-n | EEx-d or EEx-e | Armoured cables underground or in trays or ladders. |
| Special non-hazardous | IP 55 | Low Voltage IP 3 1<br>High Voltage IPH 3 | IP 31 | IP 31 | Armoured cables underground or in trays or ladders. |
| Naturally non-hazardous | Enclosures in relation to the Environment | | | | |