



Exploration & Production

GENERAL SPECIFICATION

ELECTRICAL

GS EP ELE 011

Electrical requirements for packaged units

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1. Scope

This specification defines the minimum requirements for the design, manufacture, inspection and testing of electrical equipment provided with packaged units.

This specification is to be read in conjunction with the corresponding packaged unit Project specification, drawings and data sheets, if any.

2. Reference documents

The reference documents listed below form an integral part of this General Specification. Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the EFFECTIVE DATE of the CONTRACT.

Design and engineering shall conform as a minimum requirement to the current edition of the following in order of precedence:

- Applicable laws and regulations of the country in which the system will be operated. In cases where no "local" regulations exist, the French laws and regulations shall be used
- COMPANY Particular Specifications and data sheet (if any)
- COMPANY General Specifications
- Applicable International Electro technical Commission (IEC) Publications
- Applicable CENELEC Standards
- Applicable recognized standards and codes (UTE, BS, VDE, etc.) where IEC Publications have not yet been issued.

Any conflict or inconsistency between the above set of documents (standards, specification, codes and local regulation or laws) shall be raised to COMPANY attention for resolution at tender stage.

Standards

Reference	Title
IEC 60038	IEC Standard Voltages
IEC 60050	International Electrotechnical Vocabulary
IEC 60059	IEC Standards current ratings
IEC 60529	Degrees of protection provided by enclosures (IP code)
IEC 60617	Graphical symbols for diagrams
IEC 60706	Maintainability of equipment
IEC 61000	Electro Magnetic Compatibility (EMC)
IEC 61293	Marking of electrical equipment with ratings related to electrical supply - Safety requirements
IEC 62262	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)

Professional Documents

Reference	Title
Not applicable	

Regulations

Reference	Title
94/9/EC (ATEX 100 ¹ /ATEX 95 ²)	European Directive 94/9/EC (23/03/94) on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres

Codes

Reference	Title
Not applicable	

Other documents

Reference	Title
IECEX 01	IEC Scheme for Certification to standards relating to Equipment for use in Explosive Atmospheres (IECEX Scheme) - Basic Rules
IECEX 02	IEC Scheme for Certification to standards relating to Equipment for use in Explosive Atmospheres (IECEX Scheme) - Equipment Certification Program covering equipment for use in explosive atmospheres - Rules of Procedure

Total General Specifications

Reference	Title
GS EP ELE 031	Design of earthing and bonding system
GS EP ELE 061	Minimum requirements for HV and LV cable sizing
GS EP ELE 079	Electrical apparatus for potentially explosive gas atmospheres
GS EP ELE 111	Induction motors
GS EP ELE 135	Low voltage switchgear assembly
GS EP ELE 137	Distribution boards
GS EP ELE 151	DC uninterruptible power systems (UPS)

¹ Reference to Articles 100/118 of the Treaty of Rome

² Reference to Articles 95/137 of the Treaty of Amsterdam

Reference	Title
GS EP ELE 161	Electrical cables
GS EP ELE 331	Tape trace heating
GS EP INS 110	Instrumentation for package units
GS EP MEC 290	Rotating machines packages

3. Service conditions

3.1 Environmental conditions

Electrical equipment of the packaged unit, which is installed outdoor, shall be designed to operate in an ambient temperature corresponding to the maximum outside temperature as defined in the project specific environmental data

The minimum degree of protection of enclosures shall comply with the requirements of the GS EP ELE 079.

Equipment located indoors (e.g. control panels) shall be installed within air conditioned rooms with an ambient air temperature of 25°C but they shall be able to operate as long as room temperature does not exceed 40°C.

Where the atmosphere is saliferous or corrosive (ex H₂S), the package SUPPLIER shall indicate in his proposal the additional provisions taken (for external and internal parts as well).

3.2 Area classification

The packaged unit and all associated equipment shall be located in either a safe or in hazardous area.

Selection of electrical equipment for hazardous areas shall be done in accordance with the COMPANY Specification GS EP ELE 079.

3.3 Offshore service conditions

Due to limited space and access on offshore site withdrawal space and lifting of heavy components during repair and maintenance shall be clearly defined on the SUPPLIER's general arrangement drawing.

4. System voltage

4.1 Voltages and neutral earthing

Unless otherwise specified in Project particular specification, the voltages provided by the COMPANY for electrical equipment shall be:

- HV motive and power distribution : 11 kV or 6.6 kV - 50 Hz - earthed by low impedance
- LV motive and main power distribution: 400 V 50 Hz - 3 phases - 3 wires - IT system (earthed via high impedance)
- Lighting and small power distribution: 400 V/230 V -50 Hz - 3 phases - 4 wires - TT system

- UPS distribution: 400 V / 2300 VAC - IT system
- DC distribution: 24, 48 or 1100 VDC unearthed.

Use of voltage levels and/or frequencies not herein recommended is subject to written COMPANY approval.

Any other voltage required (control circuit, safety control voltage, etc.) shall be built in the package.

If a backed-up or uninterrupted voltage is required for the package operation the package SUPPLIER's bid shall clearly mention it.

Auxiliary power supplies shall be provided at a single point. Package internal distribution shall be arranged from this delivery point to the different consumers.

4.2 Electrical System Variations

Electrical equipment shall be designed for variations as follows:

- AC Voltages: $\pm 10\%$, frequency: $\pm 5\%$
- DC voltages: +10 -15%.

5. General requirements

The package SUPPLIER shall be responsible for engineering and detailed design for all electrical equipment required for the operation of the package.

The package SUPPLIER shall indicate to the COMPANY the equipment likely to cause disturbances in the electrical system such as voltage drops, over voltages or harmonics

He shall also indicate their levels and any corrective action.

6. Equipment and materials

6.1 Materials, workmanship and suitability

All materials and parts included in the packaged unit shall be new, of current manufacture, of the highest grade and free from all defects and imperfections likely to affect to their performance.

All equipment shall be robust, heavy duty industrial type. Domestic/commercial type equipment will not be acceptable.

Prototype or unproven equipment not having a well established operating record will not be considered.

Items of equipment and materials and their components shall be of standard type and, similar parts and components shall normally be interchangeable. The number of item type shall be limited.

The design of electrical equipment shall protect personnel against risk of electrical shocks by all available means of interlock, insulation, screens, partitions, enclosures and warning labels.

6.2 Motors

The package SUPPLIER shall provide all the motors in accordance with the COMPANY specification **GS EP ELE 111** and the motor's data sheet if any.

The package SUPPLIER shall be responsible for the rating and the functional characteristics to match the driven unit.

6.3 Motor starters and LV feeders switchboard

When specified in the project specification, motor starters/feeders switchboards (MCC's) shall be supplied and located in an air conditioned room.

MCC shall comply with the LV switchboard COMPANY specification **GS EP ELE 135**. The type and make are generally imposed by COMPANY.

6.4 Electrical Unit Control Panels (UCP)

When required an electrical unit control panel for meters, switches, operating logic, protection relays shall be supplied in accordance with the COMPANY specification **GS EP ELE 137**.

Other UCP shall be designed according to **GS EP INS 110**.

6.4.1 Outdoor installation

Electrical UCP shall comprise an outer double door with windows to allow the meters selector, switch positions, etc. to be seen.

Electrical UCP shall be fitted with a removable gland plate sized such as to accommodate cable glands for all incoming and outgoing circuits including plugs for spare circuits.

6.4.2 Indoor installation

Unless otherwise specified, Electrical UCP shall be according to **GS EP ELE 137**.

6.4.3 UCP construction requirements

UCP shall be arranged to permit easy access to terminals and easy removal of all components without interference to the panel structure, other parts components or cabling.

Plastics (subject to COMPANY's approval), may be used for minor supports and electrical control wiring trunking. All plastic supports, trunking, etc., shall be of a flame retardant material and shall have a low oxygen index and low smoke/HCL emission.

Lifting eyes are required on top of each panel, capable of supporting the fully equipped panel during shipping or placing operations.

6.5 DC Battery chargers and batteries

When specified in the packaged unit project specification the package SUPPLIER shall purchase the battery charger and batteries. They shall be in accordance with the COMPANY specification **GS EP ELE 151**.

When battery charger and batteries are located in the electrical room and/or battery room the Battery charger supplier shall size the cables between the batteries and the battery charger.

6.6 Cables

6.6.1 General

All electrical interconnection between equipment mounted on the packaged unit shall be carried out by the Package SUPPLIER to ensure minimum installation operations on site.

Electrical cables for power and control shall be designed in accordance with **GS EP ELE 161**.

Cables shall be sized with respect to fault level, voltage drop and an overall derating factor according to **GS EP ELE 061**.

All cables and wirings shall be made of one continuous length (no splicing).

Cables shall be mechanically protected where required (armour, covers, lids etc.).

Mixing of two different voltages (sources and/or levels) into the same cable is forbidden.

6.6.2 Interconnecting cabling

Motors and space heaters, if any, shall be directly fed without intermediate junction boxes.

All other wiring for external connections shall be brought to suitable terminal boxes at the package skid limits.

Consideration shall be given to the segregation of electrical and control wiring especially where Intrinsically Safe (IS) circuits are concerned.

6.6.3 Cable identification

Each cable shall be identified with permanent cable markers (embossed Stainless Steel for outdoor, plastic type acceptable for indoor).

Wiring and terminals shall be numbered as shown on drawings.

Each conductor shall be separately terminated and shall have ferrules at both ends. These ferrules shall be of engraved plastic slip on, interlocked and self grip type, etc.

Spare cores shall be marked spare.

6.7 Cable terminations

6.7.1 General

The Package SUPPLIER shall ensure sufficient space in any enclosure for the CONTRACTOR to gland field cables.

Cable entries which are not used shall be fitted with blind plug approved for use with the equipment.

All connections shall be properly terminated in terminal block assemblies (no use of plug and sockets for control circuits is allowed).

Single core cable shall enter into equipment via non magnetic gland plate and shall be clamped to withstand the maximum short-circuit conditions.

Only one core conductor shall be connected to one terminal.

All cable conductors shall be provided with cable crimped lugs of the compression type.

All cores shall have an elastic shrink sleeve over the cable core.

All spare cable cores shall be individually terminated at the spare terminals.

Barrier plates shall be provided on the terminal block to maintain segregation of different voltages (power, control and instrumentation terminals).

A minimum of 10% spare terminals shall be provided.

Terminal block connections shall be identified.

6.7.2 Outdoor terminations

Outdoor cable entries shall be from bottom.

For external connection to the package, un-drilled gland plates shall be provided in order to be drilled on site without disconnection of the cables already connected.

All type of cable connections shall allow easy removal of the motor without breaking or stressing the supply cable sealing

6.7.3 Cable entries

6.7.3.1 Cable glands

Unless otherwise specified, all cable glands for interconnection within the package shall be supplied by the Package SUPPLIER.

Cable gland MANUFACTURER and type shall be approved by the COMPANY.

For certified equipment, cable glands shall be certified accordingly (i.e.: EEx"d" glands for EEx"d" equipment).

Cable glands shall be properly sized.

For offshore installation, cables shall be terminated into enclosures using mechanical compression type cable glands, either Nickel plated Brass or stainless steel 316L (metallic enclosures or armoured cables), or polyamide (Polyester enclosures and non armoured cables). Aluminium alloy cable glands are prohibited.

For onshore installation, cables shall be terminated into enclosures using mechanical compression type cable glands, either Brass (metallic enclosures or armoured cables) or polyamide (Polyester enclosures and non armoured cables).

Spare and unused entries shall be properly plugged or sealed.

6.7.3.2 Cable transit system

Cable transit system may be used for package enclosure entries and shall be supplied by the Package SUPPLIER.

6.8 Cable laying

6.8.1 Cable tray

The package SUPPLIER shall provide all the required cable trays.

Cable trays shall be heavy duty perforated type and:

For indoor:

- Hot dip galvanised.

For outdoor:

- Heavy duty 316L stainless steel
- Aluminium 5754
- Glass Reinforced Polyester (GRP).

The installation shall be complete with all fittings to form a continuous cable route.

Only manufacturer fittings and accessories shall be used.

Cable trays shall be bolted down to the supports. (No welding is permitted).

Cable supports shall be welded on the package structure.

6.8.2 Installation

The Package SUPPLIER shall be responsible for the cable routing, installation, connection and mechanical protection of all cables in his scope.

Maintenance and removal of equipment shall be possible without cable trays removing.

Separate racking/trays shall be supplied for HV, LV, control cables and instrument cables.

Cable crossing shall be performed at right angles, with a vertical distance of 200 mm minimum.

Cable trays shall not be installed adjacent to any heated pipes or ducts. Where crossing above heated pipes or ducts is unavoidable, the cables must be kept at least 150 mm from the outer surface of insulation, or a heat barrier shall be installed.

Cables for stand by and duty equipment shall be run on separate routing.

Cable shall be strapped to tray or rack with stainless steel tie wraps, PVC or nylon coated (plastic cable ties are not acceptable).

In order to prevent any stress on cable terminations and mechanical damage, excessive free unsupported cable running between cable tray and gland plate is not acceptable and cable bending radius shall be respected.

Protective covers shall be installed in any area where mechanical, chemical risks or heat (external sources, sun rays, etc.) may be expected.

Electronic and signal wiring shall be adequately separated from any power or control wiring to minimise electrical interferences.

Cables shall be bundled in groups of not more than 12 for control cables, five for power cables up to 25 mm² and individually strapped for others.

6.9 Lighting

When required the package SUPPLIER shall provide luminaires.

Luminaires shall be heavy duty type, industrial, IP55 and IK08 minimum.

When emergency lighting is required, the luminaires shall be self maintained type with integrated Ni/Cd batteries with at least 90 minutes autonomy. All emergency luminaires shall be certified category 2, even for those located in a safe area.

Location and positioning of luminaires shall be done with the aim of easing normal operation and maintenance of the package.

200 Lux minimum is required inside the package enclosure.

Lighting circuits shall be wired to separate junction boxes.

Lighting switches shall be double pole.

6.10 Control stations and emergency stop push buttons

When required, the package SUPPLIER shall mount on the package local control stations such as pushbuttons, selector switches, indicating lights, etc.

Whenever possible, control stations shall be located close to the motor or equipment, at the non drive end side and opposite to the terminal box.

They shall be mounted at minimum 1.5 m above the floor.

Control station pushbuttons shall be shrouded.

Each button shall operate a pair of N/O and N/C contacts

Emergency stop pushbuttons shall have a red mushroom head with latch-in facility in the stop position (stay put). They shall be protected against inadvertent action.

Colours of the pushbuttons and indicating lights shall be approved by the COMPANY.

Enclosures shall be made of Glass Reinforced Polyester (GRP).

Selector switches shall have padlocking facilities.

6.11 Heat tracing

When specified, the heat tracing shall be within the Package SUPPLIER'S scope. It shall be in accordance with the COMPANY specification **GS EP ELE 331**.

6.12 Junction boxes

The package SUPPLIER shall provide all necessary junction boxes. They shall be easily accessible.

Enclosures shall be Glass Reinforced Polyester (GRP).

Junction boxes shall be equipped with a pressure compensation element and with 10% of spare entries.

7. Earthing and bonding

Earthing and bonding shall be in accordance with the COMPANY specification **GS EP ELE 031**.

Earth cables shall be PVC insulated copper, 500 V, coloured green/yellow and suitably sized.

Where a motor is enclosed in duct work (i.e. fan...), its frame earth conductor shall be brought out.

8. Equipment identification

All external electrical equipment shall be identified by 316L Stainless Steel nameplates attached by 316L Stainless Steel rivets or screws. Each plate shall indicate the item tag number and shall be apparent, securely and permanently attached.

Tagging shall be done in such a way that equipment certification is not affected. Certified enclosures shall not to be drilled or altered in any way.

All electrical components (i.e. cables, fuses, terminals, contactors, pushbuttons, relays, etc.), shall be clearly identified both physically and on drawings and diagrams.

Labels shall not be fixed to components which may be replaced or removed such as trunking covers, box lids, etc., unless a second label is fitted internally to ensure correct replacement.

All special warning/safety notices and operating or maintenance instructions shall be written on separate plates directly posted on the equipment where practical.

9. Factory Acceptance Tests (FAT)

Electrical equipment shall be tested at the Package SUPPLIER's works in presence of COMPANY or his representative. When required, preliminary tests shall be performed at the SUB-SUPPLIER's works.

10. Documentation

The Package SUPPLIER shall issue all drawings and documentation related to his supply, including subcontractors, if any.

Drawings and documents shall be in accordance with IEC requirements (symbols - units).

The package SUPPLIER shall provide at least the following documents:

10.1 With the bid

- Electrical consumer list
- Load balance for each voltage levels
- General Arrangement Drawings
- Equipment data sheets
- Detailed equipment information (technical documentation)
- Type test reports (when applicable)
- Component/equipment obsolescence plan (at least for switchgear, UPS, Control System, Relays or any electronic devices).
- Deviation list from COMPANY and/or Project specifications (if any)
- List of proposed MANUFACTURERS/SUPPLIERS from PROJECT Vendor list.

10.2 For approval

- Arrangement details of electrical equipment
- Schematic diagrams of switchboards and control panels

- Layout of switchboards and control panels
- Detailed consumer list with for each consumer: rating, absorbed current, duty factor, etc.
- Chargers and batteries sizing calculation note, if any
- DC distribution schematic diagram
- Cable schedule
- Interconnection and external wiring diagrams
- Installation drawings including equipment location and cable routing
- Specification/data sheets related to supplied equipment (motors, switchboards, cables, etc.)
- Details drawings of terminal boxes
- Heat tracing layout, if any
- Earthing lay out
- Lighting drawings (lay out - single line diagram)
- Electrical equipment FAT procedures
- List of Special tools for maintenance.

10.3 Final documentation

- As-built drawings
- FAT reports
- Electrical system operating and maintenance manuals
- Spare part list
- Sub-supplier documentation
- Component/equipment obsolescence plan (at least for switchgear, UPS, Control System, Relays or any electronic devices).

10.4 Certification documents (as per directive **ATEX 94/9/EC**)

- EC declaration of conformity (issued by the Package SUPPLIER)
- (EC)Type examination certificate(s) (issued by a Notified Body).

(EC) Type examination certificates shall be provided by the package SUPPLIER for each electrical equipment and component.

Alternatively for facilities located outside the European Union (EU countries) and when approved by the Project, IECEx Certificate of Conformity (CoC - delivered by an Ex Certification Body (ExCB) as defined in § 6.2.1 of **GS EP ELE 079**) can be provided for each individual electrical equipment.

These documents shall be provided upon delivery of the packaged unit.