



Exploration & Production

GENERAL SPECIFICATION

ELECTRICAL

GS EP ELE 122

LV Variable Speed Drive Systems for ESP

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Owner: DEV/TEC

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1. Scope

This specification defines the minimum requirements for design, manufacture, inspection and testing of LV variable speed drive systems dedicated to supply Electric Submersible Pump. It has to be read in conjunction with the corresponding project specification and/or data sheets.

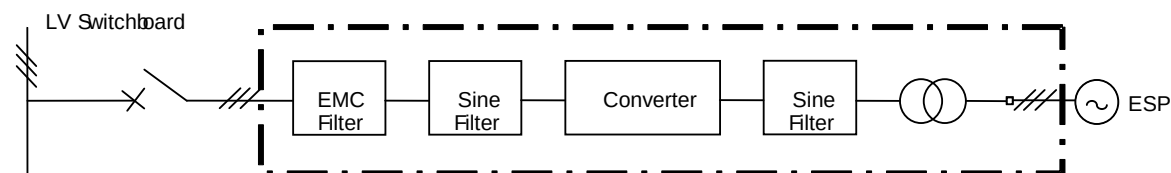
The Supplier shall clearly identify in his technical offer any deviation to these specifications.

The LV variable speed drive system comprises as shown below EMC filter, input and output sine filter, converter and step up transformer including CT, VT and a possible change over switch depending of the configuration.

2 configurations are possible as described here under.

Configuration 1

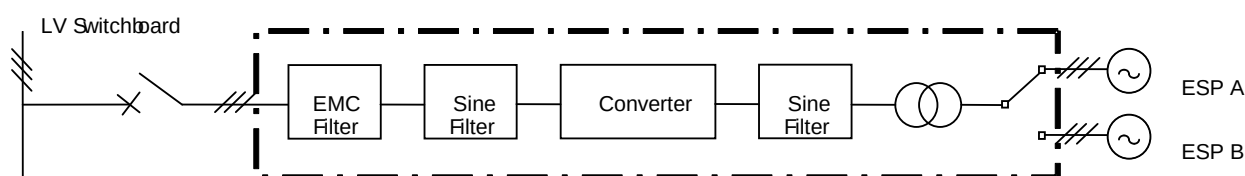
LV variable speed drive system supplies one Electric Submersible Pump.



LV Variable Speed Drive System

Configuration 2

LV variable speed drive system supplies two Electric Submersible Pumps (one running, one in standby) located in the same well.



LV Variable Speed Drive System

2. Reference documents

The reference documents listed below form an integral part of this 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 preference:

- 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) Standards

- Applicable CENELEC Standards
- Applicable recognised standards and codes (e.g. UTE-NFC, BSI, VDE, etc.) where IEC publications have not yet been issued.

Standards

Reference	Title
IEC 60076 (All parts)	Power transformers - (All parts)
IEC 60146	Semiconductor converters general requirements
IEC 60204-1	Safety of machinery - Electrical equipment of machines
IEC 60269-1	Low voltage fuses- Part 1: General requirements
IEC 60445	Basic and safety principles for man-machine interface, marking and identification
IEC 60529	Classification of degrees of protection provided by enclosures
IEC 60947	Low-voltage switchgear and controlgear
IEC 61000	Electromagnetic compatibility (EMC)
IEC 61378 (Parts 1; 3)	Converter transformers – (Parts 1; 3)
IEC 61439	Low-voltage switchgear and controlgear assemblies
IEC 61641	Enclosed low-voltage switchgear and controlgear assemblies – Guide for testing under conditions of arcing due to internal fault
IEC 61800 (Parts 2; 3; 5)	Adjustable speed electrical power drive systems – (Parts 2; 3; 5)
IEC 62262	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)
IEEE Std 519	Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
ISO 12944-2	Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 2: classification of environments

Professional Documents

Reference	Title
Not applicable	

Regulations

Reference	Title
Not applicable	

**Codes**

Reference	Title
Not applicable	

Other documents

Reference	Title
Not applicable	

Total General Specifications

Reference	Title
GS EP COR 350	External protection of offshore and coastal structures and equipment by painting
GS EP COR 354	External protection of onshore structures and equipment by painting
GS EP ELE 011	Electrical requirements for packaged units
GS EP ELE 079	Electrical apparatus for potentially explosive gas atmospheres
GS EP ELE 141	Power transformers
GS EP ELE 221	Electrical Control System (ECS)
GS EP PVV 145	Flanges
GS EP SAF 221	Safety rules for buildings
GS EP TEC 007	Obsolescence and Lifetime Cycle Management

3. Abbreviations

VSDS	Variable Speed Drive Systems
VSI	Voltage Source Inverter
DHMS	Down Hole Monitoring System
ESD	Emergency Shutdown
ESP	Electric Submersible Pump
PIM	Permanent Insulation Monitoring
VT	Voltage Transformer
CT	Current Transformer
MTTF	Mean Time To Failure



ECS	Electrical Control System
ICSS	Integrated Control and Safety System
DSC	Distributed Control system

4. Design Requirements

4.1 General

VSDS shall be suitable for continuous full load service and for the operational duty of the driven equipment within the rated conditions and specified ambient conditions without exceeding the temperature rises specified in the standards and without deleterious effects of any kind.

The VSDS shall be capable of withstanding the thermal and dynamic stresses and transient such as those resulting from a short circuit. Any damage resulting from such a short circuit or internal fault shall be confined to the component concerned to avoid damage to other parts of the VSDS.

The Supplier shall provide at the bid stage, the heat generated by all indoor equipment across the full operating range of the VSDS.

4.2 Environmental Conditions

Unless otherwise specified, indoor electrical equipment shall normally be installed within a separate non-hazardous, pressurised, air conditioned, clean and dry building or container with an average ambient air temperature of 25°C but they shall be able to operate as long as room temperature does not exceed 40°C.

Outdoor electrical equipment shall be designed to operate continuously in an ambient temperature corresponding to the extreme outside temperatures as defined in the project specific environmental data.

VSDS and all associated equipment shall be suitable for the specified place of installation with typical atmosphere of dusty and corrosive.

Power transformers will be located outdoor.

4.3 Power Supply Conditions

4.3.1 Voltages and neutral earthing

Unless otherwise specified in Project particular specification, the voltages provided by the Company for auxiliary equipment at 50Hz shall be:

- Motive and main power distribution: 400 V or 690V AC - 3 phases – 3 wires- IT system
- Lighting and small power distribution: 400V / 230 V AC - 3 phases - 4 Wires - TT system
- UPS distribution: 400 V / 230 V AC – IT system
- DC distribution: 24, 48 or 110 V DC 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, 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.

4.3.2 Electrical System Variations

Electrical equipment shall be designed for variations as follows:

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

4.4 Operational Safety, Availability, Reliability, Maintainability

The design of the VSDS shall be based on the provision of a safe and reliable supply of electricity at all times. Safe conditions shall be ensured under all operating conditions, including those associated with start-up and shut-down of plant and equipment and throughout the intervening shut-down periods.

For all operational and maintenance purposes, modules which need to be changes or maintained shall be removable and replaceable without dismantling other components.

The design of the VSDS shall ensure periods of continuous operation of at least 5 years.

The VSDS including all individual components forming part of the system shall have an availability of at least 0.997 and a minimum MTTF of 5 years.

The VSDS shall be designed for 20 years operation under the specified operating conditions and adapted inspection, maintenance and repair program.

All hardware and software that may be developed by the Supplier further to the VSDS delivery, shall ensure full ascending compatibility to allow for easy replacement of equipment that became obsolete.

The Supplier shall guarantee such hardware and software support during the expected lifetime of the facilities.

The VSDS converter cubicle shall have a front door emergency stop button which shall be guarded with plastic cover to protect them from accidentals shutdown.

4.5 Degree of Protection

Minimum degree of protection of equipment shall be:

- Outdoor equipment: IP55
- Indoor equipment: IP21

4.6 Internal Arc Fault

The VSDS shall be designed to withstand an internal arc fault.

4.7 Outdoor Equipment in Hazardous Areas

All outdoor equipment shall be suitable for Zone 2, category 3G, gas group IIA - temperature T3 minimum.