



Exploration & Production

GENERAL SPECIFICATION

ELECTRICAL

GS EP ELE 113

AC generators

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1. Scope

The purpose of this specification is to set out the general requirements for the electrical design, manufacture and performance of AC generators driven by diesel, gas engine or turbine to be installed in Company sites located either onshore or offshore.

It covers the requirements of normal, essential or emergency supply application.

This specification shall be used with the data sheets (refer to attachment 1 & 2).

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.

Generators shall conform in design, materials and performance with the appropriate sections of the latest editions (with amendments) of the relevant IEC and CENELEC standards.

The following order of precedence applies specifically to electrical equipment:

- Applicable Laws, rules and regulations of the country in which the system will be operated. In cases where no "local" regulations exist, then French laws and regulations shall be used
- Company Particular specifications and Data sheets
- Company General Specifications
- Applicable International Electrotechnical Commission (IEC) standards Applicable European Standards by CENELEC
- Applicable recognised standards and codes (UTE-NFC, BS, VDE, etc.) when 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.

Standards

Reference	Title
IEC 60034 (Parts 1; 6; 9; 14)	Rotating Electrical Machines - (Parts 1; 6; 9; 14)
IEC 60072 (Parts 1; 2; 3)	Dimensions and output ratings for rotating electrical machines - (Parts 1; 2; 3)
IEC 60079	Electrical apparatus for explosive gas atmospheres
IEC 60085	Thermal evaluation and classification of electrical insulation
IEC 60529	Classification of Degree of Protection Provided by Enclosures
IEC 61000	Electromagnetic compatibility (EMC)
IEC 61000-2-4	Electromagnetic compatibility (EMC) - Part 2-4: Environment - Compatibility levels in industrial plants for low-frequency conducted disturbances



Reference	Title
IEC 62262	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)
IEC 62402	Obsolescence management - Application guide
IEEE 43	IEEE recommended practice for testing insulation resistance of rotating machinery (ANSI)
ISO 7919-1	Mechanical vibration of non-reciprocating machines. Measurements on rotating shafts and evaluation criteria. Part 1: general guidelines.

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 013	Electrical requirements for generating units
GS EP ELE 079	Electrical apparatus for potentially explosive gas atmospheres
GS EP TEC 007	Obsolescence and Lifetime Cycle Management

3. Environment conditions

The minimum degree of protection of enclosures shall comply with the following (according to IEC 60529):

- Indoor equipment IP 23
- Outdoor equipment IP 55
- Indoor or outdoor equipment IK 08

4. General**4.1 Materials, workmanship and suitability**

All materials and parts included in the construction of the specified generation system shall be new and unused, of current manufacture, of the highest grade, and free from all defects and imperfections likely to affect its performance.

4.2 Specification deviations

The Supplier shall advise Company of any deviations made in respect of this specification at the time of tendering. All deviations shall be mentioned into the datasheet (refer to attachment 1 & 2).

Should this Specification conflict with requirements of the listed standards, the Supplier shall request clarification from the Company.

4.3 Rating and performance**4.3.1 General**

Unless otherwise specified in the data sheet, the generators shall be suitable for continuous full load service, duty type S1, at the rated power and specified ambient conditions without any harmful effects.

The rated power of the generators shall exceed the installed capability (under peak load) of the associated prime mover under all conditions and at all temperatures in the specified range.

The generators, excitation systems and all accessories shall be designed and constructed in accordance with good engineering practices which shall result in an expected lifetime of at least 20 years. The machines shall be suitable for at least three years uninterrupted operation under the conditions specified.

4.3.2 Auxiliary supplies

Unless otherwise specified in the data sheet the voltages provided by Company for auxiliary equipment shall be:

- 400 V AC - 3 phase from normal supply (earthed through a 150 mA high impedance)
- 230 V AC - phase/neutral TT or TNS from normal supply
- 230 V AC UPS - 1 phase floating
- DC voltage - 24 or 48 V DC floating.

The auxiliary loads shall be included into the power balance.

4.3.3 Momentary excess current

The generators shall be capable, from normal operating temperature, of carrying without damage a stator current of:

- 150% of the rated current for a period of at least 30 seconds in each hour period
- 110% of the rated current for a period of at least one hour in each 6-hours period, without dangerous overheating.

4.3.4 Sudden short circuit

The generators shall be designed to withstand without damage a short circuit of any kind (and at least 300% of the rated generator current) at the terminals, whilst operating at rated load and 105% of rated voltage, for a period of three seconds.

4.3.5 Form and symmetry of voltages and currents

The generators shall be able of operating on an unbalanced system as defined in [IEC 60034-1](#) paragraph 7.2.

The performance of the equipment shall not be affected by Harmonic voltage THD up to 10% and each Individual Harmonic Distortion within the limits of class 3, tables 3 and 4 of [IEC 61000-2-4](#).

Should the limits of deformation and balance occur simultaneously in service at the rated load, this shall not lead to any deleterious temperature in the generator and the excess resulting temperature rise or temperature related to be limits specified in this standard shall be not more than approximately 10K.

4.3.6 Total Harmonic Distortion

When tested on open-circuit and at rated speed and voltage and when measured according to the methods laid down in [IEC 60034-1](#) section 9.11.3, the following Total Harmonic Distortion (THD) and individual harmonic limitations shall not be exceeded.

	THD	Individual Harmonic Voltage
	in % of rated voltage	in % of rated voltage
HV Generators	3.0	2.0
LV Generators	5.0	3.0

4.3.7 Excitation system

The excitation system shall be designed for a rated power factor of 0.8 leading (overexcited) at rated output, expressed in kilo-volt-amperes, and with the generator voltage between 90% and 110% of the rated value.

The output voltage of the generator shall be adjustable between 90% and 110% of the rated value during normal operation with steady-state voltage variation limited to $\pm 0.5\%$ of the setpoint when islanded. Each excitation system shall be rated for at least 110% of the excitation current required during full load operation at rated voltage and rated power factor.

The generator shall allow 100% voltage to be maintained at 90% speed.

The voltage variation at generator terminals after instantaneous application of 100% load (Power Factor 0.8) shall not exceed -15%, and recovery to 97% of rated voltage shall occur within 1.5 seconds. This shall be guaranteed by detailed calculation note.

The Manufacturer shall provide details of the voltage response of the generators to the sudden application of large loads (i.e. half rated output and rated output), for Company approval.

Generator shall withstand the following duty cycle, repeated every five minutes:

- Continuous rated current (stator)
- Ceiling voltage for 10 seconds (excitation)
- Continuous rated current (stator).

4.3.8 Parallel operation

Where more than one generator is specified the units shall be suitable for parallel operation with each other or network. The generators shall operate with the other units under load conditions up to their maximum output whereby the power factor shall be maintained at the same value.

4.3.9 Earth faults

The Manufacturer shall provide Company with the external earth fault withstand capability curve: $i_0 = f(t)$.

Unless otherwise specified in the data sheet, the minimum requirement current for HV generators shall be 30A for three seconds, without exceeding the specified temperature rise limits.

4.3.10 Mechanical

4.3.10.1 Critical speeds

Generator with a rigid and subcritical rotor bearing shall have the first critical speed not lower than 125% of the rated speed. For generator with a flexible, overcritical rotor bearing, the first

critical speed shall not be above 80% of rated speed and the second not lower than 125% of rated speed.

The prime mover Manufacturer shall perform a torsional analysis of the complete system. The generator Manufacturer shall provide all required data in a timely fashion to allow this work to proceed including dimensional data to prepare the torsional model as well as generator air gap torque and dynamic torque characteristics during system fault conditions.

4.3.10.2 Vibration

The vibration levels for generators will be as per the requirements of the [IEC 60034-14](#) as follows:

- HV generators will be type B vibration grade
- LV generators will be type A vibration grade, and for specific applications type B might be required

The limits of maximum vibration magnitude in displacement, velocity and acceleration (r.m.s.) shall be as per table 1 of [IEC 60034-14](#). For HV generators this test shall be carried out with a free-suspension mounting condition, the test bench rigidity shall correspond to the rigidity of the machine mounted "in situ".

The limit of the maximum peak to peak shaft vibrations (S_{p-p}) and maximum run-out shall be as per table 2 of [IEC 60034-14](#). The maximum relative shaft displacement shall include the run-out. The Run-out definition is as per [ISO 7919-1](#).

Vibration of the generator frame, including terminal boxes, shall not cause any damage to the machine and shall be limited to 4.5 mm/s.

These maximum allowable vibration levels shall apply for testing the machine alone in the factory and testing the machine mounted "in situ". These levels shall apply to all operating temperatures between ambient and maximum operating temperature, and all operating conditions between no-load and maximum capability, and all levels of bearing oil viscosity between the minimum and maximum specified for the bearings.

5. Construction requirements

5.1 General

Products that are highly toxic to the environment or that are considered potentially carcinogenic (e.g. asbestos) shall not be used. The use of hygroscopic materials shall be avoided. Materials shall be selected to prevent contact corrosion.

Generators shall have jacking bolts or facilities to raise the machine with the aid of a mechanical jacking device to facilitate alignment of the generator with the prime mover.

Safety during operation and maintenance shall be carefully considered during design of the generators and auxiliaries.

Frames shall be equipped with two earth connection facilities located at readily accessible locations on opposite sides of the complete skid. In case of a remotely located terminal box, an earth connection shall be provided within the box.



5.2 Machine cooling

Unless otherwise specified in the data sheet, cooling method shall be as per [IEC 60034-6](#) and as following:

- IC 0A1 for IP 23
- IC 4A1A1, IC 5A1A1, IC 6A1A1, IC6A1A6 or IC8A1W7 for IP 54 or IP 55.

Cooling system assemblies shall be designed such that the natural frequency of vibration is neither excited by the generator running frequency nor its harmonics.

Number of cooling pumps and fans shall be designed with n+1 redundancy.

5.2.1 Air-to-water cooled machines

Each cooler shall be provided with a water leakage detector of piezzo type. The water box/header construction shall be such that leaking tubes can be readily plugged and that all tubes are accessible for cleaning.

Machines shall be provided with local temperature indicators for water inlets and outlets and also cooling air temperature detectors to measure the temperature of the primary air after the heat exchangers.

Primary coolant shall always be air.

Secondary coolant shall be treated water and may be either sea water or fresh water, depending on local availability.

Where seawater is circulated within the heat exchanger then double tube design shall be used. In case of fresh water, single tube design shall be used.

Tubes/header/waterbox shall be made of Cupro-Nickel for both sea or fresh water coolant provided that maximum flow speed (including turbulence effects) is lower than 2.5 m/s and the water circulation is permanent. Tubes/header/waterbox shall be made of stainless steel 316L for fresh water coolant whenever maximum flow speed (including turbulence effects) is more than 2.5 m/s or the water circulation is not permanent (ex generator not permanently in operation: -3X50% running configuration).

For sea water application where maximum flow speed (including turbulence effects) is more than 2.5 m/s, tube/header/waterbox material selection shall be made on a case by case basis, depending on temperature ranges and after evaluation of crevice corrosion risks.

Tubes/header/waterbox may be made of carbon steel for onshore installation without any environmental corrosion risk (H₂S) and where fresh water is available,

Whatever the coolant and operation configuration, the tube/header/waterbox material choice shall be subject to written Company approval after a complete corrosion study carried out by Contractor.

For generator above 15 MW, dual coolers (complete with separate water boxes, valves and dedicated leakage detector) shall be fitted, each capable of meeting at least 60% of cooling requirements of full rated output of generator. The Supplier shall advise derated output (power versus time curve) of unit operating:

- On one cooler only
- Without cooling (black start operation).



Unless otherwise specified in the data sheet, the “remote” heat exchanger, required for cooling the treated water in a closed circuit, is provided by the Company.

5.2.2 Machines with open coolant circuit (IC0xx to IC3xx)

Cooling air quality for open coolant circuit machines (IC0xx to IC3xx) shall be clearly assessed at the basic design engineering stage. When required, the cooling air shall be obtained from a dedicated air intake system via filtration. The generator Manufacturer shall liaise with the drive Manufacturer to ensure all requirements are satisfied and all ducts, fans, etc. are provided.

5.3 Stator frame

5.3.1 Frame

The stator frame shall be of heavy duty cast or fabricated steel construction. The generator frame and bearing supports shall have sufficient strength and rigidity to avoid distortion or increased vibration as a result of external mechanical forces such as tightening of fixing bolts.

5.3.2 Magnetic circuit

The magnetic circuit shall consist of low-loss laminations securely held in position.

5.3.3 Windings

5.3.3.1 Insulation (Stator and Rotor)

HV generator stator and rotor insulation shall be class “F”, provided by vacuum pressure Impregnation process. LV generator insulation shall be insulation “H” or “F”, according to the Manufacturer standard.

Temperature rise class Temperature rise shall be class “B” when insulation class is “F” and “F” when insulation class is “H”.

5.3.3.2 Exciter

Windings of the main exciter and pilot exciter shall be of enamelled wire with suitable Phase to earth and inter-phase insulation.

Impregnation procedure shall be as for the stator windings. For low voltage exciter and rotor fed with a voltage below 380V dip impregnation is acceptable.

When a permanent magnet exciter is used, it shall have its magnets energised so as to avoid any subsequent intervention after an adverse electromagnetic field environment, consecutive to transient phenomena such as heavy short-circuits.

5.3.3.3 Stator

The stator windings shall consist of identical coils made of enamelled wire or preformed copper bar conductors covered with mica materials or equivalent.

Winding shall be vacuum pressure impregnated and shall be adequately supported, braced, and blocked to withstand without damage the dynamic stresses occurring during short-circuit.

The stator windings shall be externally star connected.



Unless otherwise specified in the data sheet, the stator winding shall be fitted with 2 PT 100 Resistance Temperature Detectors in the hottest part of each phase winding. RTD's shall be either three or four wire types.

5.3.3.4 Rotor

The field windings shall be made of copper protected from corrosion with either resin or varnish. The field coils shall withstand all normal transient conditions (electromechanical and electro-dynamical stress) occurring during a balanced or unbalanced short circuit.

5.3.4 Anti-condensation heater

Anti-condensation heater shall be designed to avoid deterioration of the generator due to condensation.

Unless otherwise specified in the data sheet, heaters shall be of a fully insulated design and suitable for 230 VAC supply.

5.4 Terminals and terminal boxes

The generators shall be provided with separate terminal boxes between power and control circuits.

All electrical connections shall be brought to terminals.

Power terminal box shall be sized according to connection constraints (cable's type Cu or Al, section, bending radius, lug's size, etc.).

The power terminal box shall be accommodated to put all required current transformers for control, measurement and protection.

Clamping devices to withstand short circuit currents shall be provided within the main terminal box for cable connections, to separate and support the conductors.

For HV generator, the star point shall be brought out of the enclosure in a dedicated terminal box. This terminal box shall be sized to accommodate installation of differential protection CTs.

In auxiliary cable connecting boxes, unused wires of multicore cables shall be brought to terminals.

Cable gland plates or cable transits shall be provided, and shall be non-magnetic for single core cable connections.

5.5 Rotor

5.5.1 Shafts

Rotor shafts shall be one piece, heat-treated forged steel construction.

Welding on finished shafts and rotors is prohibited. Shafts and/or spiders subject to welding shall be stress relieved after welding.



The rotor shall withstand without any mechanical damage or permanent distortion:

- The maximum torque variations under operating conditions: short-circuit, emergency shutdown, etc.
- The maximum overspeed, which may be reached after a full load rejection or a manual governing action.

5.5.2 Balancing

Rotor balancing shall be conducted at rated speed, and shall be followed by an overspeed test at 1.2 times rated speed for at least two minutes.

Impedance of the rotor shall be measured before and after the test to detect loose connections.

Balancing shall be conducted with half coupling.

Rotor shall be equipped with provisions, which allow addition of balancing weights by use of bolts in specially threaded holes directly in the rotor body.

Balancing weights shall not be of lead or similar ductile material.

Fans could be separately and individually balanced prior to mounting on the rotor shaft. Fans shall be of non-corroding material or shall be effectively treated with a corrosion resistant coating (after balancing of the rotor assembly).

5.6 Rotating exciter

The rotating exciter shall be of brushless type.

It shall consist of a Permanent Magnetic Generator (PMG), and a rotating rectifier assembly controlled by an Automatic Voltage Regulation AVR.

The current rating of the semi-conductors utilised in the rotating rectifier shall not be less than 200% of the maximum current flowing through the elements at maximum continuous excitation current.

The rotating exciter diodes shall be of hermetically sealed silicon type protected against abnormal transient conditions by surge protector.

When a parallel connection of semi-conductors is used, the above current rating shall be not less than 220% for the parallel group.

The repetitive reverse blocking voltage rating of the semi-conductors shall be not less than 200% of the maximum peak voltage generated by the main exciter.

Both the Permanent Magnet Generator and the rotating brushless exciter shall be mounted outboard of the bearing.

Excitation protection system shall be able to detect the failure of any diode in the rectifier bridge assembly.

When applicable, the voltage transformer for the AVR power supply and generator voltage sensing shall be located within the generator switchboard or dedicated cubicle.

5.7 Maintenance access

The generators shall be fitted with suitable inspection plates and access covers which shall be designed for quick and simple removal.



Access shall be provided to measure air gap at Drive End and Non Drive End.

Access to the rotating excitation rectifier equipment shall be adequately sized to permit easy maintenance.

Ease of rotor withdrawal to facilitate rapid inspection and repair in service shall be considered as a highly desirable feature.

5.8 Generator earthing

The generator shall be equipped with two external earth lugs located at readily accessible locations and at least 15 mm diameter located on opposite sides of the complete skid.

In the case of a remotely located terminal box, an earth connection shall be provided within each box.

Unless otherwise specified in the data sheet, the shaft shall be electrically connected to the earth terminal, when all bearings and the rotor winding of a machine are insulated

5.9 Bearings for generator driven by turbine

The bearings shall be force oil lubricated sleeve types, of standard design from a specialised Manufacturer. For large machines, tilting pad bearings may be used.

Unless otherwise specified in data sheet, both bearings (drive and non drive end) shall be fully insulated from the generator frame to prevent the flow of shaft currents.

It shall allow correct bearing insulation resistance measurement during operation without bridging the insulation.

Piping and instrument connections shall not bridge the insulation.

This bearing shall be adequately labelled to indicate the presence of insulation.

Shaft earthing shall be made at drive end bearing side by the use of slip ring or brush.

At Non Drive End side, a slip ring or brush shall be used for the Rotor Earth Fault protection (64R).

Sleeve bearings shall be of the self aligning type.

The bearing design shall be such that the replacement of liners will be possible without the removal of the rotor, the lower half of the end bell or plate, the coupling or the exciter.

Each bearing shall include as a minimum:

- Dual or two resistance temperature detectors (located in the area of minimum oil thickness), giving bearing white metal temperature. RTD shall be PT100, three or four wire types
- Local oil flowmeter or oil level gauge
- X-Y vibration probes (if specified in Project particular specification)
- Accelerometer.

5.10 Lubrication for generator driven by turbine

Lubrication system shall be common for the generator and its driver, in accordance with mechanical specification.



Supplier shall clearly define the lubrication requirements for phases such as start-up and shutdown (jacking up system, lube oil pressure maintain up to stand still, etc.).

5.11 General requirements related to EEx”p” design

An automatic leakage compensation unit shall be supplied by the generator Manufacturer and shall ensure the necessary purging cycle prior to the generator start and maintain the minimum required pressurisation during generator operation.

No external power supply shall be required. All the controls shall be performed from the Instrument Air supplied by others. The generator pressurisation system shall be equipped at the air inlet with a filter (40µm or lower) and its associated by-pass system for maintenance.

All hardware shall be preferably mounted on the generator pressure control cabinet.

Any pressure decrease under a pre-set threshold (1mbar for example) shall initiate immediate equipment shut down and shall be signaled remotely to the Process Control System.

5.12 Generator protection

Refer to [GS EP ELE 013](#).

Preferably, for the stator differential protection one set of CT's shall be located within the generator terminal box and one set in the incomer cubicle of the switchboard, in any case the generator Manufacturer shall provide the six current transformers.

Other protection devices as recommended by the Manufacturer shall be submitted to Company approval.

All the recommended settings shall be provided by the Manufacturer prior to FAT.

5.13 Labels and rating plates

The generator shall be fitted with a rating plate as defined in the [IEC 60034](#). Also, labels shall be provided for all auxiliary terminal boxes.

Terminal boxes shall be fully and clearly identified in accordance with the drawings using engraved traffolyte labels with black letters on white background. Labels shall be attached to non-removable parts using corrosion proof screws.

The Manufacturer shall supply a second rating plate to be mounted on the main equipment.

5.14 Noise levels

Generator noise levels shall comply with [IEC 60034-9](#). For generator rated above 5500 kW, noise level shall be submitted to Company for approval.

5.15 Special tools

A complete set of any special tools required for operation, maintenance and testing shall be provided.

The Supplier shall provide a list of special tools, individually priced, with his quotation.

6. Inspection and testing

6.1 Qualification tests

The Supplier shall supply type test certificates carried out on similar equipment in accordance with the IEC publications along with this proposal.

- Short-circuit current test at a voltage 0.5 times the rated voltage
- Hot spot temperature test
- Short circuit test for reactance and time constant determination at reduced voltage
- Noise level
- Tests on batteries and chargers (complying with the relevant specification requirements)
- Occasional excess current test
- Overspeed test (120% - 2 min).

6.2 Factory Acceptance Tests (FAT)

These tests shall be carried out in the presence of Company at the Manufacturer's works and shall comprise routine tests in accordance with the relevant standards and other additional tests when specified in the data sheet.

Unless otherwise specified in the data sheet, these tests shall be carried out individually on each machine

When tests are required for just one machine, the Company select which machine will be tested.

6.2.1 Tests shall be carried out prior shipping any generators. Routine tests

A test certificate shall be supplied for each machine.

- Physical inspection for compliance with specification and standards
- Dimensional checks
- Insulation resistance test on all windings, heaters, RTDs, etc.
- Power, frequency and voltage withstand test
- Cold winding resistance measurement of stator, rotor and exciter
- Measurements and calculations of all stator saturated and non-saturated impedances (X_d , X_q , X_o , $X'd$, etc.)
- No-load wave form analysis
- No-load saturation test
- Phase sequence
- Dielectric tests
- Polarisation Index (as per [IEEE 43](#))
- Vibration test at no load, full speed

- Bearing temperature rise at no load, full speed
- Sleeve bearing inspection plus insulation measurement if any
- Running tests on all auxiliary devices, sensors, anti-condensation heater, etc.
- Rotor balancing test (during manufacture)
- Calculation of efficiency at 50%, 75% and 100% load, at rated power factor.

All HV machines shall be subject to:

- Polarization index test as per [IEEE 43](#),
- Partial discharge measurements,
- Overspeed test,
- Vibration measurement (unfiltered) from 0 to 120% of the rated speed and determination of the critical speed.

6.2.2 Full load tests

When full load tests are required in the data sheet, the following tests shall be carried out:

- Measurements of efficiency at 50%, 75% and 100% load, at rated power factor
- Generator heat run test
 - Measurements:
 - . Winding insulation resistance after heat run
 - . Temperature rise
 - . Vibrations
 - . Bearing temperature rise
- Full load wave analysis
- Voltage and current phases balance
- Over load test 110% 1 hr
- Measurement of voltage recovery time after sudden 70% block load application (power factor 0.8) for gas engine driven generator
- Measurements of voltage recovery time after sudden 100% block load application (power factor 0.8) for diesel engine driven generator
- Measurements of voltage recovery time after 100% rejection load application (power factor 0.8) for gas or diesel engine driven generator.

6.3 Test reports

A pro-forma of test reports shall be presented to the Company for approval before placing the order.

The test reports shall detail as a minimum:

- The expected theoretical values

- The tolerances
- The results of the measurements, including if applicable, any intermediate value which has caused a temporary rejection.

The test reports shall be included in the Contractual technical documents, and shall be considered as an integral part of them.

7. Design Life and Obsolescence

Facilities are typically designed with an expected design life in the order of 25 years.

The obsolescence shall be managed as per [GS EP TEC 007](#).

The generating unit design shall therefore take into account the requirement that the equipment will most probably require to be upgraded during the design life of the facilities in particular for all the electronic based components. These requirements shall be incorporated from Basic Engineering stage.

The design will include provisions to allow an upgrade of the generating unit to be performed with minimal disturbance.

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

At the Bid stage, the Supplier shall detail his lifecycle management strategy focusing on product obsolescence, support options and further migration alternatives. The lifecycle/obsolescence management plan and associated cost shall be part of the Bid process evaluation.

The Supplier shall complete an inventory of all provided equipment (hardware and software) matching to different lifecycles phases, including all Sub-Vendors equipment.

The Supplier shall guarantee that:

- Components (including software and hardware) shall remain in the “active products” range (i.e. supporting developments and releases) over a period of at least 5 years after the Site Acceptance Tests (SAT).
- An announcement to Customer is provided 5 years prior the end of the commercial phase.
- Components (including software and hardware) shall be fully supported and available over a period of at least 15 years after the SAT.
- Maintenance services including availability of engineering services shall be available to support the package and components during the plant life time.

8. Documentation to be provided

As a minimum, the following drawings and documentation shall be supplied according to the specified schedule:

- General arrangement of generator
- Generator rotor detail drawings
- Arrangement details of auxiliary equipment
- Detail drawings of all terminal boxes



- Rating plate and nameplate drawings
- Short circuit current versus time and voltage/speed versus time after 50% block load acceptance curves
- Data sheet showing full machine characteristics: short circuit ratio, reactances (X_d , X'_d , X''_d , X_2 , X_0 , etc.), time constants (T'_{do} , T'_d , T''_d , etc.), etc.
- Generator capability charts and P-Q diagram
- Generator, AVR complete model for dynamic stability studies
- Preliminary protection setting recommendation
- Quality plan
- Obsolescence management dossier
- Operation and maintenance manuals and technical details
- Spare part list for commissioning and two year operation.

9. Other references

Following documents are applicable:

- Standards: [IEC 60072](#), [IEC 60079](#), [IEC 60085](#), [IEC 62262](#), [IEC 62402](#)
- Total General Specifications: [GS EP COR 350](#), [GS EP COR 354](#), [GS EP ELE 079](#).



Appendix 1 Data Sheet

Synchronous generator driven by turbines



Exploration & Production

General Specification

Date: 01/2012

GS EP ELE 113

Rev: 07

Appendix 1



Exploration & Production

DATA SHEET	N° _____
Project:	_____
DS EP ELE 113 Rev. 04 - 01/2011	Synchronous generator driven by turbines

Rev. Date						
Written						
Verified						
Approved						

Appel d'offres/Call for tender ☐		Commande/Order ☐	
1			
2	Repère	Nombre de générateurs	
3	Tag number	Number of generators	
4			
5	CONDITIONS D'INSTALLATION		
6	SITE ENVIRONMENTAL CONDITIONS		
7			
8	Lieu d'installation	On-shore ☐	Off-shore ☐
9	Site		
10			
11	Température ambiante Moyenne annuelle °C	Maximum °C	Minimum °C
12	Ambient temperature Yearly average		
13			
14	Altitude (si > 1000 m) m	Hygrométrie %	
15	Altitude (if > 1000 m above sea level)	Humidity	
16			
17	Atmosphère corrosive ☐	Embruns salins ☐	H ₂ S ☐
18	Corrosive atmosphere	Sea spray	Other
19			
20	Localisation (IEC 60079-10) Zone 2 ☐	Hors zone Safe area ☐	Pollution
21	Location		Pollution
22			
23	RESEAU EXISTANT		
24	EXISTING NETWORK		
25			
26	Régime de neutre	Limitation du courant de défaut à la terre A	Temps d'élimination s
27	Neutral earthing	Earth fault current limitation	Clearing time
28			
29	Distorsion Harmonique THD	Réseau public ☐	
30	THD Harmonic distortion	Public grid	
31			
32	CARACTERISTIQUES DE L'ALTERNATEUR		
33	ALTERNATOR DATA		
34			
35	Puissance nominale kVA	Tension nominale V	Cos phi
36	Rated output power	Rated voltage	Power factor
37			
38	Vitesse nominale rpm	Fréquence Hz	Marche en parallèle ☐
39	Rated speed	Frequency	Parallel operation
40			
41	Service type	Groupeement du matériel (CEI 60079) :	Classification en température
42	Duty type	Apparatus grouping (IEC 60079)	Temperature classification
43			
44	Mode de protection	Ex"px" ☐	Ex "d" ☐
45	Type of protection		
46			
47	Indice de protection IP	IP 55 ☐	Autre
48	Degree of protection IP		W ☐
49			
50	Enroulements stator	Nombre de bornes sorties	
51	Stator windings	Number of power terminals	
52			
53	Enroulements rotor	Classe d'isolation	Classe d'échauffement
54	Rotor windings	Insulation class	Temperature rise class
55			
56			
57			
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DATA SHEET	N°
Project:	
DS EP ELE 113 Rev. 04 - 01/2011	Synchronous generator driven by turbines

Appel d'offres/Call for tender	☐	Commande/Order	☐
1			
2			
3	Niveau de bruit maximum admissible CEI 60034-9 dB		
4	Maximum permissible noise level		
5			
6	Mode de refroidissement (CEI 60034-6)	Auto ventilé ☐	Moto ventilé ☐
7	Cooling system (IEC 60034-6)	Self ventilated	Moto ventilated
8	IC		
9	Par réfrigérant ☐	Air/air ☐	Air/eau ☐
10	By cooler	CACA	CACW
11	Echangeur double tube ☐		
12	Double tube exchanger		
13	Eau de mer ☐	Eau douce ☐	Eau circuit fermé ☐
14	Sea water	Soft water	Closed circuit water
15	Temp entrée de l'eau °C	Temp de sortie de l'eau °C	Matériau Tube, boîte à eau
16	Inlet Water Temperature	Outlet Water Temperature	Tube/Water Box Material
17			
18	Pression à l'entrée bars	Pertes de charges maximum bars	
19	Inlet pressure	Maximum Differential Pressure	
20			
21	Paliers ☐	Roulements ☐	Roulements précontraints ☐
22	Bearings	Roller bearings	Pre loaded roller bearings
23	Coussinets ☐		
24	Sleeve bearings		
25	Patin oscillant ☐		
26	Tilting pad		
27			
28	Classe de vibrations selon ISO 10816-1: 2,5 ☐	mm/s rms	Autre mm/s rms
29	Vibration class according to ISO 10816-1		
30			
31	Type d'accouplement		
32	Coupling type		
33			
34	EXCITATION		
35	EXCITATION		
36			
37	Système d'excitation	Shunt ☐	Indépendant ☐
38	Excitation type	Separate	
39			
40	Source du régulateur de tension :	Générateur à aimant permanent en bout d'arbre (PMG) ☐	
41	Automatic voltage regulator	Permanent magnet generator at shaft end (PMG)	
42			
43	Soutirage sur la Sortie alternateur ☐		
44	Powered from the alternator output		
45			
46	Stabilité de tension en régime transitoire/Voltage stability		
47	Démarrage moteur	Puissance nominale	Cos Phi
48	Motor starting	Rated output	Chute de tension %
49	Puissance initiale	Courant démarrage Id/In	
50	Initial load	Id/In start current	
51	Magnétisation transfo	Puissance nominale	Cos Phi
52	inrush transformer current	Rated output power	Chute de tension %
53	Puissance initiale	Courant magnétisant Im/In	
54	Initial load	Im/In inrush current	
55			
56	ACCESSOIRES		
57	ACCESSORIES		
58			
59	Capteur de vibration X-Y palier	Nombre	Type
60	X-Y bearing vibration detector	Number	
61			
62	Purges eau de condensation ☐		
63	Condensed water drain		

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DATA SHEET	N°
Project:	
DS EP ELE 113 Rev. 04 - 01/2011	Synchronous generator driven by turbines

Appel d'offres/Call for tender ☐		Commande/Order ☐	
1			
2	Boîtes à bornes	Position	Avec PE ☐
3	Main terminal box	Location	Type de PE
4			
5	TC protection différentielle dans boîte à bornes		6 TC ☐
6	Current transformers intalled in the terminal box		3 TC ☐
7			
8	Câble de puissance	Type	Tripolaire : ☐
9	Power cable		Unipolaire ☐
10			
11	Section	Cuivre ☐	Aluminium ☐
12	Cross section	mm ²	Nombre par phase
13			
14	Diamètre sur isolant	Diamètre sur armure :	Diamètre extérieur :
15	Diameter on	mm	Outer sheath diameter
16			
17	Boîtes à bornes auxiliaires	Nombre	Mode de protection
18	Auxiliaries jonction boxes	Number	Protection of enclosure
19			
20	Avec P.E. ☐	Nature	
21	With cable glands	Type	
22			
23	Peinture	Standard fournisseur à soumettre avec l'offre pour approbation ☐	Spécif Client N° GS COR 350 ☐
24	Painting	Manufacturer's standard to be submitted with the bid for approval	Customer specif N°GS COR 350
25			
26	Sources auxiliaires disponibles	48V DC ☐	24V DC ☐
27	Available auxiliary supplies		
28			
29	ESSAIS		
30	TESTS		
31			
32	Réception usine : ☐	Présence d'un représentant du client ☐	Réception sur site ☐
33	Factory's acceptance tests	With client's inspector	Site acceptance tests
34			
35	Essais de routine	Sur l'ensemble des générateurs ☐	Sur un des générateurs au choix du client ☐
36	Routine tests	On each generator	On one generator selected by CLIENT
37			
38	Essais complets	Sur l'ensemble des générateurs ☐	Sur un des générateurs au choix du client ☐
39	Full tests	On each generator	On one generator selected by CLIENT
40			
41	Mesure des impédances synchrones ☐	Test anti condensation ☐	
42	Generator synchronous impedance	Anti-condensation heater test	
43			
44	Essais spéciaux		
45	Special tests		
46			
47			
48			
49			
50	CONDITIONS PARTICULIERES		
51	SPECIAL REQUIREMENTS		
52			
53	Comptabilité électromagnétique selon CEI 61000 ☐	Installations électriques à bord des navires CEI 60092 ☐	
54	Electromagnetic compatibility as per IEC 61000	Electrical installations in ships IEC 60092	
55			
56	Installation électrique à bord des navires selon CEI 60092-301 ☐		
57	Electrical installations in ship as per IEC 60092-301		
58			
59	Attestation d'examen de type : ☐	Par un organisme agréé ☐	Autre
60	Type examination certificate	By notified body	Other
61			
62			

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DATA SHEET	N°
Project:	
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Appel d'offres/Call for tender ☐		Commande/Order ☐	
CARACTERISTIQUES A FOURNIR PAR LE CONSTRUCTEUR CHARACTERISTICS TO BE SUPPLIED BY THE MANUFACTURER			
1			
2			
3			
4			
5	Constructeur	Type de l'alternateur	Mode de protection
6	Manufacturer	Alternator type	Type of protection
7			
8	Puissance nominale kVA	Tension nominale V	Intensité nominale A
9	Rated output	Rated voltage	Rated intensity
10			
11	Vitesse nominale rpm	Fréquence Hz	Rotor
12	Rated speed	Frequency	Rotor type
13			
14	Classe d'échauffement	Classe d'isolation	
15	Temperature rise class	Insulated class	
16			
17	Surcharge admissible/Overload capabilities : 110 %	durant min	nombre par an
18	Tenue au CC/Short-circuit withstanding 150 %	during min	number per year
19	300 %	s	
20			
21	Puissance sans système de refroidissement kVA	Courbe Puissance (temps) à fournir	
22	Output power without cooling system	Curve to be provided Power versus time	
23			
24	Moment d'inertie kgm ²	Constante d'inertie	H =
25	Moment of inertia	Inertia constant	
26			
27	Rendement en % à cos phi=1 4/4:	3/4:	1/2:
28	Efficiency at power factor=1:		
29			
30	Rendement en % à cos phi0,8: 4/4:	3/4:	1/2:
31	Efficiency at power factor.8:		
32			
33	Excitation: Type de la régulation de tension (selon IEEE)		
34	Automatic voltage regulator type (according IEEE)		
35			
36	Carcasse fonte ☐	acier soudé ☐	autre
37	Frame cast iron	steel	other
38			
39	Réactances / Impedances		
40			
41	Synchrone longitudinale saturée / saturated p.u	Transitoire longitudinale saturée / saturated p.u	
42	Direct-axis synchronous non-saturée / unsaturated p.u	Direct-axis transient non-saturée / unsaturated p.u	
43			
44	Subtransitoire longitudinale saturée p.u		
45	Direct-axis subtransient saturated +/- tol		
46			
47	Synchrone transversale saturée / saturated p.u	Transitoire transversale saturée / saturated p.u	
48	Quadrature-axis synchronous non-saturée / unsaturated p.u	Quadrature-axis transient non-saturée / unsaturated p.u	
49			
50	Subtransitoire transversale saturée p.u		
51	Quadrature-axis subtransient saturated		
52			
53	Reactance de Potier p.u	Reactance inverse p.u	
54	Potier reactance	Negative sequence (Unsat./Sat.)	
55			
56	Réactance homopolaire p.u	Reactance de fuite du stator p.u	
57	Zero sequence (saturated/unsaturated)	Armature leakage	
58			
59	Résistances :		
60			
61	Résistance directe R1 or RA p.u	Résistance inverse R2 p.u	
62	Positive sequence resistance (armature)	Negative sequence resistance	
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Appel d'offres/Call for tender ☐		Commande/Order ☐	
1			
2	Resistance homopolaire	R0	p.u
3	Zero sequence resistance		
4	Constantes de temps / Time constants		Transitoire en phase en court-circuit
5			Direct axis transient short circuit
6			T'd
7	Transitoire en phase à vide	T'do	s
8	Direct axis transient open circuit		
9			Transitoire en quadrature à vide
10	Subtransitoire en phase à vide	T''do	s
11	Direct axis subtransient open circuit		
12			Subtransitoire en quadrature à vide
13	Subtransitoire en phase en court-circuit	T''d	s
14	Direct axis sub transient short circuit		
15			Subtransitoire en quadrature en court-circuit
16	Rapport de court-circuit	SCR	
17	Short circuit ratio		Induit en court-circuit
18			Armature short circuit
19	Tension démarrage du point de saturation	Sbreak	p.u.
20	Terminal voltage at which generator saturation starts		Facteur de saturation à XX% de la tension nominale
21			Saturation factor at XX% terminal voltage
22	Courant d'excitation : A vide	A	A charge nominale
23	Field current: At no load		At rated load
24			Facteur d'amortissement
25	Fonction de transfert de la régulation de vitesse		Damping ratio
26	Speed regulator transfer function (prime mover)		
27			
28	Caractéristiques du lubrifiant / Lubricant characteristics		
29			
30	Huile	Viscosité	Consommation
31	Oil	Viscosity	Flowrate
32			
33	Graisse	Quantité	Fréquence de graissage
34	Grease	Quantity	Greasing frequency
35			
36	Type de paliers :	Côté accouplement	Côté opposé à l'accouplement
37	Type of journal bearing:	Drive end	Non drive end
38			
39	Type de roulements :	Côté accouplement	Côté opposé à l'accouplement
40	Type of ball bearings:	Drive end	Non drive end
41			
42	Réchauffage :	Puissance	
43	Space heater	Power	kW
44			
45	Dimensions de l'alternateur (cm) :	Longueur	Largeur
46	Size of the alternator (cm):	Length	Width
47			Hauteur
48	Masses :	Totale	
49	Weight	Total	kg
50			Rotor
51	Dimensions de l'armoire d'excitation (cm):	Longueur	Largeur
52	Size of the excitation cabinet (cm):	Length	Width
53			Hauteur
54			
55	Attestation d'examen de type :	Par le constructeur	Par un organisme agréé
56	Type examination certificate	Manufacturer's certificate	By notified Body
57			
58	Nom de l'organisme		Référence du certificat
59	Notified body		Certificate reference

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DATA SHEET	N°
Project:	
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Appel d'offres/Call for tender ☐		Commande/Order ☐	
Pour générateur à surpression interne seulement / For pressurised Ex "px" generator only			
Pression Pressure	Pa	Débit Flow rate	Nm ³ /h
		Temps balayage Flushing time	mn
			A débit (Nm ³ /h) At flow rate
Pressostat Pressure switch	☐	Seuil d'alarme Alarm Threshold	Pa
		Seuil déclenchement Trip Threshold	Pa
		Type	
Electrovanne Electrovalve	☐	Tension Voltage	V
		Type	
Vanne manuelle Hand valve	☐	Nombre Quantity	
		Type	
Modèles et réglages des régulateurs de tension et vitesse à fournir AVR and Governor Models and settings to be provided			
Divergences par rapport à la spécification Deviations from job specification			
Cachet constructeur alternateur Alternator manufacturer's stamp			
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Appendix 2 Data Sheet

Synchronous generator driven by diesel engines



Exploration & Production

DATA SHEET	N° []
Project:	[]
DS EP ELE 115 Rev. 03 - 01/2011	Synchronous generator driven by diesel engines

Rev. Date	[]	[]	[]	[]	[]	[]
Written	[]	[]	[]	[]	[]	[]
Verified	[]	[]	[]	[]	[]	[]
Approved	[]	[]	[]	[]	[]	[]



Appel d'offres/Call for tender ☐		Commande/Order ☐	
1			
2			
3	Repère Tag number []	Nombre de générateurs Number of generators []	
4			
5	CONDITIONS D'INSTALLATION SITE ENVIRONMENTAL CONDITIONS		
6			
7			
8	Lieu d'installation Site []	On-shore ☐	Off-shore ☐
9			
10			
11	Température ambiante : Ambient temperature	Moyenne annuelle Yearly average [] °C	Maximum [] °C Minimum [] °C
12			
13			
14	Altitude (si > 1000 m) : Altitude (if > 1000 m above sea level)	[] m	Hygrométrie Humidity [] %
15			
16			
17	Atmosphère corrosive Corrosive atmosphere ☐	Embruns salins Sea spray ☐	H ₂ S ☐ Autre Other []
18			
19			
20	Location (IEC 60079-10) : Location	Zone 2 ☐	Hors zone Safe area ☐ Pollution Pollution []
21			
22			
23	RESEAU EXISTANT EXISTING NETWORK		
24			
25			
26	Régime de neutre neutral earthing []	Limitation du courant de défaut à la terre Earth fault current limitation [] A	Temps d'élimination Clearing time [] S
27			
28			
29	Distorsion Harmonique THD THD Harmonic distortion []		
30			
31			
32	CARACTERISTIQUES DE L'ALTERNATEUR ALTERNATOR DATA		
33			
34			
35	Puissance nominale Rated output power [] kVA	Tension nominale Rated voltage [] V	Cos phi Power factor []
36			
37			
38	Vitesse nominale Rated speed [] rpm	Fréquence Frequency [] Hz	
39			
40			
41	Groupement matériel (CEI 60079) Apparatus grouping (CEI 60079) []		Température maximale de surface : Maximum surface temperature []
42			
43			
44	Mode de protection : Type of protection	Ex"d" ☐	Ex"px" ☐ Ex"nA" ☐
45			
46			
47			
48	Indice de protection IP Degree of protection IP	IP 55 ☐	Autre [] W ☐ S ☐
49			
50			
51	Enroulements stator Stator windings ☐	Nombre de bornes sorties Number of power terminals []	
52			
53			
54	Enroulements rotor Rotor windings ☐	Classe d'isolation Insulation class []	Classe d'échauffement Temperature rise class []
55			
56			
57			

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DATA SHEET	N°
Project:	
DS EP ELE 113	Synchronous generator driven by diesel engines
Rev. 03 - 01/2011	

Appel d'offres/Call for tender ☐		Commande/Order ☐	
1			
2	Niveau de bruit maximum admissible CEI 60034-9 dB		
3	Maximum permissible noise level		
4			
5	Mode de refroidissement (CEI 60034-6) Auto ventilé ☐ Moto ventilé ☐		
6	Cooling system Self ventilated Moto ventilated		
7			
8	Par réfrigérant ☐ Air/air ☐ Air/eau ☐ Echangeur double tube ☐		
9	By cooler Air to air Air to water Water double tube exchanger		
10			
11	Temp entrée de l'eau °C	Temp de sortie de l'eau °C	Matériau Tube, boîte à eau
12	Inlet Water Temperature	Outlet Water Temperature	Tube/Water Box Material
13			
14	Pression à l'entrée bars	Pertes de charges maximum bars	
15	Inlet pressure	Maximum Differential Pressure	
16			
17	Paliers ☐	Roulements ☐	Roulements précontraints ☐
18	Bearings	Roller bearings	Pre loaded roller bearings
19			
20	Classe de vibrations selon ISO 10816-1 : 2,5 mm/s rms		
21	Vibration class according to ISO 10816-1		
22			
23	Type d'accouplement		
24	Coupling type		
25			
26	EXCITATION		
27	EXCITATION		
28			
29	Système : ☐	Shunt ☐	Indépendant ☐
30	System:	Separate	
31			
32	Source du régulateur de tension : ☐	Génératrice à aimant permanent en bout d'arbre (PMG) ☐	
33	Automatic voltage regulator:	Permanent magnet generator at the end shaft (PMG)	
34			
35	Soutirage sur la sortie alternateur ☐		
36	Powered from the alternator output		
37			
38	Stabilité de tension en régime transitoire/Voltage stability:		
39			
40	Démarrage moteur ☐	Puissance nominale	Cos Phi Id/In % Puissance initiale
41	On motor starting	Rated output power	Power factor Is/In Initial load
42			
43	Magnétisation transfo ☐	Puissance nominale	Cos Phi Id/In % Puissance initiale
44	Tranfo magnetisation	Rated output power	Power factor Is/In Initial load
45			
46	ACCESSOIRES		
47	ACCESSOIRES		
48			
49			
50	Capteur de vibration X-Y Palier : ☐	Nombre	Type
51	X-Y bearing vibration detector	Number	
52			
53	Purges eau de condensation ☐		
54	Condensed water drain		
55			
56			
57	Boîte à bornes puissance : ☐	Position	Avec PE ☐ Type de PE
58	Main terminal box	Location	With cable glands Type of gland
59			
60	TC protection différentielle dans boîte à bornes ☐	3TC ☐	6TC ☐
61	Current transformers installed in the terminal box		
62			
63			

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DATA SHEET	N°
Project:	
DS EP ELE 113	Synchronous generator driven by diesel engines
Rev. 03 - 01/2011	

Appel d'offres/Call for tender	☐	Commande/Order	☐
1			
2			
3	Câble de puissance :	Type	
4	Power cable		
5			
6	Section	mm ²	
7	Cross section		
8			
9	Diamètre sur isolant :	mm	
10	Diameter on insulation		
11			
12			
13	Boîtes à bornes auxiliaires	Nombre	
14	Auxiliaries junction boxes	Number	
15			
16			
17	Avec P.E		
18	With cable glands		
19	Peinture	Standard fournisseur à soumettre avec l'offre pour approbation	
20	Painting	Manufacturer's standard to be submitted with the bid for approval	
21			
22	Sources auxiliaires	48V	
23	Auxiliary supplies	24V	
24			
25			
26			
27			
28	Réception usine :	Présence d'un représentant du client	
29	Factory's acceptance tests:	With client's inspector	
30			
31	Essais de routine	Sur l'ensemble des générateurs	
32	Routine tests	On each generator	
33			
34	Essais complets	Sur l'ensemble des générateurs	
35	Full tests	On each generator	
36			
37	Mesure des impédances synchrones	Test anti condensation	
38	Generator synchronous impedance	Anti-condensation heater test	
39			
40	Essais spéciaux :		
41	Special tests		
42			
43			
44			
45			
46			
47			
48			
49			
50			
51	Comptabilité électromagnétique selon CEI 61000 :	Installations électriques à bord des navires CEI 60092	
52	Electromagnetic compatibility as per IEC 61000:	Electrical installations in ships IEC 60092	
53			
54	Installation électrique à bord des navires selon CEI 60092-301		
55	Electrical installations in ship as per IEC 60092-301		
56			
57	Attestation d'examen de type :	Par un organisme agréé	
58	Type examination certificate	By notified body	
59			
60			

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DATA SHEET	N°
Project:	
DS EP ELE 113	Synchronous generator driven by diesel engines
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Appel d'offres/Call for tender ☐		Commande/Order ☐	
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63			
CHARACTERISTIQUES A FOURNIR PAR LE CONSTRUCTEUR CHARACTERISTICS TO BE SUPPLIED BY THE MANUFACTURER			
Constructeur:		Type de l'alternateur	
Manufacturer		Alternator type	
Puissance nominale kVA		Tension nominale V	
Rated output power		Rated voltage	
Vitesse nominale rpm		Fréquence Hz	
Rated speed		Frequency	
Classe d'échauffement		Classe d'isolation	
Temperature rise class		Insulated class	
Surcharge admissible/Overload capabilities: 110 % durant min		Intensité nominale A	
Tenue au CC/Short-circuit withstanding 150 % durant min		Cos phi:	
300 % durant s		Power factor	
Puissance sans système de refroidissement kVA		Courbe Puissance (temps) à fournir	
Output power without cooling system		Curve to be provided Power versus time	
Moment d'inertie kgm ²		Constante d'inertie H=	
Moment of inertia		Inertia constant	
Rendementen % à cosphi=1 4/4		3/4	
Efficiency at power factor=1			
Rendementen % à cosphi 0.8 : 4/4		3/4	
Efficiency at power factor 0.8			
Excitation: Type de la régulation de tension (selon IEEE)		Automatic voltage regulator type (according IEEE)	
Carcasse Fonte ☐ Acier soudé ☐		Autre	
Frame Cast iron Steel		Other	
Reactances:			
Synchron longitudinal saturée / saturated Xd p.u		Transitoire longitudinal saturée / saturated X'ds p.u	
Direct-axis synchronous non-saturée / unsaturated Xdu p.u		Direct-axis transient non-saturée / unsaturated X'du p.u	
Subtransitoire longitudinal saturée X"ds p.u		Subtransitoire longitudinal non saturée X"du p.u	
Direct-axis subtransient saturated		Direct-axis subtransient unsaturated	
Synchron transversale Xq p.u		Transitoire transversale saturée / saturated X'q p.u	
Quadrature-axis synchronous non-saturée / unsaturated Xqu p.u		Quadrature-axis transient non-saturée / unsaturated X'qu p.u	
Subtransitoire transversale saturée X"qs p.u		Subtransitoire transversale non saturée X"qu p.u	
Quadrature-axis subtransient saturated		Quadrature axis subtransient unsat	
Réactance de potier Xpot p.u		Réactance inverse X2 p.u	
Potier reactance		Negative sequence (Unsat/Sat)	
Réactance homopolaire Xo p.u		Réactance de fuite du stator X1 or p.u	
Zero sequence (saturated/unsaturated)		Armure leakage	
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Exploration & Production

DATA SHEET	N°
Project:	
DS EP ELE 113	Synchronous generator driven by diesel engines
Rev. 03 - 01/2011	

Appel d'offres/Call for tender ☐		Commande/Order ☐	
1			
2	Resistance:		
3			
4	Résistance direct	R1 or	
5	Positive sequence resistance (armature)	RA	p.u
6			
7	Résistance homopolaire	R0	p.u
8	Zero sequence resistance		
9			
10	Constantes de temps		Transitoire en phase en court-circuit
11	Time constants		Direct axis transient short circuit
12			T'd
13	Transitoire en phase à vide	T'do	s
14	Direct axis transient open circuit		
15			
16	Subtransitoire en phase à vide	T'do	s
17	Direct axis sub transient open circuit		
18			
19	Subtransitoire en phase court circuit	T'd	s
20	Direct axis sub transient short circuit		
21			
22	Rapport de court-circuit	SCR	
23	Short circuit ratio		
24	Tension démarrage du point de saturation	Sbreak	p.u.
25	Terminal voltage at which generator saturation starts		
26			
27	Courant d'excitation :	A vide	A
28	Field current:	At no load	
29			
30	Fonction de transfert de la régulation de vitesse		
31	Speed regulator transfer function (prime mover)		
32			
33	Caractéristiques du lubrifiant :		
34	Lubricant characteristics		
35			
36	Huile	Viscosité	
37	Oil	Viscosity	
38			
39	Graisse	Quantité	
40	Grease	Quantity	
41			
42	Type de paliers :	Côté accouplement	
43	Type of journals: bearing	Drive end	
44			
45	Type de roulements :	Côté accouplement	
46	Type of ball bearings:	Drive end	
47			
48	Réchauffage :	Puissance	W
49	Space heater		
50			
51	Dimension de l'alternateur (cm)	Longueur	
52	Size of the alternator (cm):	Length	
53			
54	Masses :	Totale	kg
55	Weight:	Total	
56			
57	Dimensions de l'armoire d'excitation (cm) :	Longueur	
58	Size of the excitation cabinet (cm):	Length	
59			
60	Attestation d'examen de type	Par le constructeur	
61	Type examination certificate	Manufacturer's certificate	
62			
63	Nom de l'organisme	Référence du certificat	
64	Notified Body	Certificate reference	

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Exploration & Production

General Specification

Date: 01/2012

GS EP ELE 113

Rev: 07

Appendix 2



Exploration & Production

DATA SHEET	N°
Project:	
DS EP ELE 115	Synchronous generator driven by diesel engines
Rev. 03 - 01/2011	

Appel d'offres/Call for tender ☐		Commande/Order ☐	
Pour générateur à surpression interne seulement / For pressurised Ex "px" generator only			
Pression Pressure	Pa	Débit Flow rate	Nm ³ /h
		Temps balayage Flushing time	mn
		A débit (Nm ³ /h) At flow rate	
Pressostat Pressure switch	☐	Seuil d'alarme Alarm Threshold	Pa
		Seuil déclenchement Trip Threshold	Pa
		Type	
Electrovanne Electrovalve	☐	Tension Voltage	V
		Type	
Vanne manuelle Hand valve	☐	Nombre Quantity	
		Type	
Modèles des régulateurs de tension et vitesse à fournir AVR and Governor Models to be provided			
Divergences par rapport à la spécification Deviations from job specification			
Cachet constructeur alternateur Alternator manufacturer's stamp			
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