



Exploration & Production

GENERAL SPECIFICATION

ELECTRICAL

GS EP ELE 141

Power transformers

06	01/2012	Reviewed as marked
05	10/2008	Update of reference standard & documents
04	10/2006	Addition of information regarding transformer type and
03	10/2005	Addition of "EP" root to GS identification
00	03/2001	First issue
Rev.	Date	Notes

Owner: DEV/TEC

Managing entity: DEV/TEC/ELE



Contents

1. Scope	4
2. Reference documents.....	4
3. Environmental conditions	6
4. Equipment for installation in hazardous area.....	6
5. Operating conditions	6
5.1 Cooling	6
5.2 Electrical operating conditions.....	7
5.3 Short Circuit Withstand Capability	7
6. Technical characteristics	7
6.1 Core.....	7
6.2 Type of transformer.....	8
6.3 Magnetic circuit.....	8
6.4 Windings.....	8
6.5 Winding connection.....	8
6.6 Oil immersed breathing type transformers.....	8
6.7 Hermetically sealed transformers.....	9
6.8 Dry-type transformers	9
6.9 Tap changers.....	10
6.10 Insulating oil.....	11
6.11 Connections.....	11
6.12 Wiring	12
6.13 Accessories	13
6.14 Neutral earthing	14
6.15 Parallel operation	14
6.16 Rating plate.....	14
6.17 Name plate	14
6.18 Labels	14
6.19 Handling.....	14
7. Painting.....	14



8. Testing and inspection	15
8.1 Qualification of Manufacturer	15
8.2 Acceptance tests.....	15
8.3 Tests reports.....	16
9. Documentation	16
10. Other references	17
Appendix 1 Data Sheet Power Transformer	18
Appendix 2 Data Sheet Earthing transformer	26

1. Scope

This specification defines the minimum technical requirements for the design, manufacture, inspection and testing of power transformers for Company installations located either onshore or offshore.

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 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
EN 50216	Power transformers and reactors fittings
IEC 60076 (Parts 1; 2; 3; 4; 5; 7; 8; 10; 11; 12; 13; 14)	Power transformers - (Parts 1; 2; 3; 4; 5; 7; 8; 10; 11; 12; 13; 14)
IEC 60079-2	Explosive atmospheres - Part 2 : equipment protection by pressurized enclosure "p"
IEC 60085	Electrical insulation - Thermal evaluation and designation
IEC 60099	Surge Arresters
IEC 60137	Insulating bushings for alternating voltages above 1000 V
IEC 60152	Identification by hour numbers of the phase conductors of 3-phase electric systems
IEC 60214 (Parts 1; 2)	Tap Changers - (Parts 1; 2)
IEC 60296	Specification for unused mineral insulating oils for transformers and switchgear
IEC 60445	Basic and safety principles for man-machine interface, marking and identification - Identification of equipment terminals, conductors terminations ,and conductors
IEC 60529	Degrees of protection provided by enclosures (IP)



Reference	Title
IEC 60616	Terminal and tapping markings for power transformers
IEC 60815	Guide for the selection of insulators in respects of polluted conditions
IEC 61099	Specifications for unused synthetic organic esters for electrical purposes
IEC 62155	Hollow pressurized and unpressurized ceramic and glass insulators for use in electrical equipment with rated voltages greater than 1 000 V
IEC 62262	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)
ISO 12944-2	Paints and varnished - Corrosion protection of steel structures by protective paint systems - Part 2: classification of environments

Professional Documents

Reference	Title
Not applicable	

Regulations

Reference	Title
94/9/EC (ATEX 100a / ATEX 95)	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
CIGRE: TF A2.32.01	Revision of tests and specifications for corrosive sulphur in transformer oils

**Total General Specifications**

Reference	Title
GS EP COR 350	External protection of offshore and coastal structures and equipment by painting
GS EP ELE 079	Electrical apparatus for potentially explosible gas atmospheres

3. Environmental conditions

The transformers shall be suitably designed for proper operation in the environmental conditions specified in the data sheet or in the project particular specification.

4. Equipment for installation in hazardous area

As per **GS EP ELE 079**, ATEX European directives **94/9/EC** or IECEx scheme shall apply for certification of transformers installed in hazardous area.

Application of ATEX European directives **94/9/EC** is mandatory in European Union (EU countries).

For category 3 equipment, certification by Manufacturer is not accepted.

Transformers and accessories shall bear their own marking, according to the mode of protection used.

5. Operating conditions**5.1 Cooling**

Power transformers shall be capable of continuous service at the rated power on all taps, without exceeding the temperatures rises specified in the Standards, and without any deleterious effects of any kind.

Cooling method for oil immersed transformers shall be chosen from the following:

- Self cooling by natural air flow and radiation (ONAN)
- Forced cooling by air impelled by fans – (ONAF)
 - The fans shall be able to operate in both automatic (controlled by thermostats) and manual modes
 - For transformer with tank insulated from earth, the fans shall be electrically insulated from the tank.
- Cooling with forced oil circulation by means of two redundant pumps (2x 100%) - OFAF or OFAN Cooling with forced oil and water circulation (OFWF)
 - Two oil circulation pumps (2x100%) shall be provided
 - Oil to Water heat exchanger shall be equipped with water leak detector.

- Plate heat exchanger shall be designed according to the operating conditions of cooling water facilities available at site.
- Unless otherwise specified in Project particular specification, plate heat exchanger shall be made of stainless steel 316L for fresh water and of Titanium for sea water.

Heat exchangers shall be redundant (2x100%) for installations without transformer redundancy.

Cooling method for dry type transformers shall be chosen from the following:

- Self cooling by natural air flow and radiation - (AN)
- Forced cooling by air impelled by fans - (AF)
 - The fans shall be in n+1 configuration and shall be able to operate in both automatic and manual modes.
- Forced air and water cooling - (AFWF)
 - The fans shall be in n+1 configuration and shall be able to operate in both automatic and manual modes.

5.2 Electrical operating conditions

Unless otherwise specified in project particular specification, the transformer shall be capable of continuous operation at rated power under conditions where the variation of the voltage to frequency ratio (U/f) does not exceed 5%. Exceptional supply variations, if any, such as those associated with large motor starting shall be detailed in the project particular specification along with any specific requirements regarding harmonic voltages and currents.

5.3 Short Circuit Withstand Capability

The transformer winding shall be capable of withstanding, on any tapping, without damage, the electro-dynamic and thermal effects of a full external short circuit on the secondary side, with the primary side connected to an infinite system fault level. The maximum permissible average winding temperature specified in the standards shall not be exceeded for the specified fault duration.

The transformer shall have been “type” tested for the short-circuit thermal and dynamic withstand capability in accordance with the relevant standards and the project specification values. The Supplier shall submit copies of the type test certificates.

6. Technical characteristics

6.1 Core

The core, framework, clamping arrangement and general structure of the transformer shall be of robust design capable of withstanding any shocks during transport, installation and service. The joint seals and fittings shall be sufficiently strong and well protected to prevent leakage under these conditions.

Furthermore for offshore platform or facilities with seismic constraint special design shall be made to reinforce the overall arrangement (silent block mounting or stronger mechanical design).

6.2 Type of transformer

Power transformers shall be of one of the following types, unless otherwise specified in the project particular specification/data-sheets:

- Oil immersed, completely filled hermetically sealed design up to 10 MVA. The Supplier may offer this type of transformer for ratings above 10 MVA with prior Company approval
- Oil immersed breathing type (expansion transformers) for all ratings starting from 10MVA. Supplier may offer this type of transformer for ratings below 10 MVA with prior Company approval
- Dry-type
- Gas cushion transformer is prohibited.

6.3 Magnetic circuit

Magnetic circuit shall be of low loss, grain oriented, individually insulated silicon steel sheets, tightly clamped to prevent vibration and to absorb stresses due to expansion and short-circuits.

For three phase transformers, in-line, three-limb cores shall be used.

The magnetic circuit shall be connected to the transformer grounding terminal or bus.

6.4 Windings

Windings shall be of copper or aluminium and uniformly insulated. The selection shall be done by the manufacturer.

6.5 Winding connection

Unless otherwise specified in the project particular specifications, the winding connection symbol for transformers shall be:

- For power transformers: Dyn 11 (Delta/Wye).

6.6 Oil immersed breathing type transformers

Oil immersed breathing type transformers shall have rigid, fully welded, sheet steel tanks with removable flange mounted radiators and conservator. The capacity of the oil conservator tank shall be such that it fully covers the oil volume expansion under the specified service conditions.

Radiators shall be provided with isolating valves fitted at the oil inlet(s) and outlet(s) in order to allow radiator removal without draining the tank. Furthermore these valves shall be provided with cap and padlocking facilities or alternatively designed to require the use of a special tool to operate.

The tank shall be mounted on a base frame with four removable travelling wheels.

The removable tank cover shall be designed to prevent water accumulation.

If tank earth fault detection is required in project particular specification/data sheet, the tank shall be insulated from the base frame and the travelling wheels. The mounting of all accessories shall consider and maintain the integrity of the tank earth fault protection scheme (i.e. no bypass to earth).

If the conservator is separately mounted (i.e. not supported by the transformer tank) all connecting pipes shall be fitted with insulating spacers.

The conservators shall be equipped with a rubber bag, a level gauge and dehydrating breather. At its lowest part the oil conservator shall have provision to collect and remove water and sludge.

Tanks shall be vacuum proof and equipped with a pressure relief valve. Provision shall be taken to collect and channel oil spillage.

On load tap changers shall be installed in a separate tank.

6.7 Hermetically sealed transformers

Hermetically sealed transformer tanks shall have flexible corrugated or folded walls and a completely welded construction.

The tank cover and cooling system assembly shall have the mechanical strength to withstand without any permanent distortion, the internal pressures caused by the contraction or expansion of the oil/liquid and gas volumes under the specified service conditions.

The tank material shall be made as far as possible of Hot Dip Galvanised steel - or, for large size transformers, coated with a Zinc-ethyl-silicate primer - with a coating adapted to the environment class of corrosivity (salt laden marine environment, corrosive environment, etc.).

For special offshore application-Stainless steel 316 L can be used for tank material, but it will require prior Company approval.

The tank shall be mounted on a base frame.

The tank cover shall be bolted.

The tank cover shall be designed to prevent water accumulation.

The tank, cover, valves and all accessories shall be hermetically sealed against air, water and insulating oil.

6.8 Dry-type transformers

Dry-type transformers cooling shall be AN.

The transformer shall be equipped with a removable protective enclosure made of steel sheet which shall provide an IP 31 protection degree. This enclosure shall be fixed to the transformer frame and equipped with lifting lugs. The transformer assembly shall be mounted on a base frame. When required in the project particular specifications/data sheets, shock absorber/anti vibration pads shall be provided.

Dry-type transformers are as follows:

- HV/LV dry-type transformers shall be cast-resin encapsulated with an insulating class F. The temperature rise shall not exceed the Class F requirements as per [IEC 60076-11](#), paragraph 11.1, table 2
- LV/LV dry-type transformers shall be either encapsulated cast resin with an insulating Class F, or impregnated with an insulating Class H. The temperature rise shall not exceed the Class F requirements as per [IEC 60076-11](#), paragraph 11.1, table 2

- In case of an ambient air temperature above the standard conditions (refer to paragraph 4.2.3), the temperature rise shall be reduced as per paragraph 11.2 of [IEC 60076-11](#)
- In case of an altitude above 1000 meters, the temperature rise shall be reduced as per paragraph 11.3 of [IEC 60076-11](#)
- Encapsulated design shall be used in offshore living quarters.

6.9 Tap changers

Unless otherwise specified in project particular specification, power transformers shall be equipped with tap-changers on the highest voltage winding.

6.9.1 Off-circuit tap-changers

6.9.1.1 Oil immersed transformers

The tap-changer manufacturing design shall avoid the contacts to be set in a position where the windings remain open-circuited or partially short-circuited.

The Tap-changer driving rod shall be permanently sealed against air or oil leakage under the specified service conditions.

The off-circuit switch handle shall be properly sized in order to allow operation without a tool and shall be installed in an easily accessible location to avoid any potential risk of injury to the operator. The tap positions shall be clearly marked, and a padlocking facility shall be provided to lock the tap-changer switch in the selected position.

6.9.1.2 Dry-type transformers

Tap-changers for dry-type transformers shall consist of a multi-position link.

6.9.2 On-load tap-changer (OLTC)

On-load tap-changer shall consist in a motor driven multi-step device, allowing automatic adjustment of the tap position. Unless otherwise specified in the project particular specification/data sheet, the tap-changer shall have 17 positions of 1.25% voltage steps ($\pm 10\%$ voltage adjustment), and shall be of high-speed transition type.

On load tap changer compartment shall be installed segregated from the transformer tank.

The tap-changer shall be equipped with an externally operated manual control for emergency conditions.

If the transformer is located in hazardous area, the protection type of the on load tap changer panel shall be Ex "px", as per [IEC 60079-2](#) with a local pressure gauge. If instrument air is not available the OLTC panel shall be equipped with 2 Nitrogen bottles, with automatic transfer and remote alarm, providing a minimum of 2.5 years operation without maintenance.

Mechanical end stops and electrical interlocks shall be provided to prevent overrunning.

The On-load tap-changer shall be equipped with various protections (such as overpressure, over-temperature and oil level monitoring (alarm and trip) and level gauge).

All control equipment, including the voltage control relay and Master/Slave unit for parallel operation of transformers, shall be installed electrical room.



In case of automatic control failure (tap changer discrepancy, regulator failure, etc.), a manual control shall be available to the operator.

All needed information (status, alarm, fault and measurements) shall be available for both local and remote (from Electrical Control System) manual operation.

6.10 Insulating oil

For oil immersed transformer the dielectric fluid shall be mineral oil.

Use of vegetal oil in hermetically sealed transformers or synthetic ester is possible with prior Company approval.

The selected oil shall be of low toxicity, environmentally safe.

The selected oil shall be non corrosive and comply with CIGRE document referenced: "TF A2.32.01 revision of tests and specifications for corrosive sulphur in transformer oils".

The use of dielectric fluid containing PCB or PCT is **absolutely prohibited**.

6.11 Connections

6.11.1 Bushings and connectors

6.11.2 High voltage

High Voltage insulated bushings shall be used for cable connection

The insulated bushings shall be of capacitive type, conform to [IEC 62155](#), for rated voltages above 52 kV.

The insulated bushings shall conform to [IEC 60137](#) for voltages up to 52kV and shall be:

- Plug-in type (for separable cable connector) up to rated voltage of 12kV for installation in hazardous area
- Plug-in type up to rated voltage of 36kV for installation in safe area:
 - Separable cable connectors shall be either straight or elbow, for dry type insulation cables
 - Key interlocking device of the cable connectors shall be provided (interlock with the primary feeder earthing switch)
 - If power connections require more than one conductor per phase, each connector shall not bear more than 2 cores.
- Porcelain bushing, for rated voltages above 12kV for installation in hazardous areas, and for rated voltages above 36kV for installation in safe area.
 - Bushing mounting shall be sealed and completely leak proof
 - They shall be of non-hygroscopic material
 - The Bushings shall withstand handling conditions during transport, erection at site and maintenance.



6.11.3 Low voltage

Low Voltage bushings shall be flat throughway providing a direct connection to bus ducts or cables.

All bushing shall be clearly marked to identify the phase connections in accordance with the connection diagram on the rating plate.

Sufficient space shall be provided in order to install CT's for differential protection when required.

6.11.4 Terminal box

Terminal box shall have sufficient dimension to provide adequate space to connect the specified cables. Cable boxes shall be designed to allow the conductors straight connection to the terminals without introducing excessive bends within the box.

If connections are specified by bus duct, the bus-duct flange will be supplied by others, however all connecting bus-bar, nuts and bolts and other accessories shall be provided by the Supplier. Flexible bus-bar shall be used for the connection of bus duct.

When two, or more, conductors have to be connected per phase, the design shall encompass the necessary provisions to ensure a straight connection of the conductors. This can be done by extending the existing bar or by installing an additional bar suitable for the continuous rated current, and able to withstand the prospective short circuit current.

The neutral point of star connected secondary windings shall be brought out into the cable connection box too.

Non magnetic gland plates shall be provided for mounting of compression type cable glands for single core cables.

Cable glands for outdoor cable boxes shall be either Nickel plated Brass or stainless steel 316.

All cable connection boxes shall have an IP 55 enclosure protection degree for outdoor transformer and IP 23 for indoors.

6.11.5 Auxiliary terminal and control box

All measuring control, alarms and auxiliary wiring shall be terminated in a single suitable terminal and control box which shall have the same IP rating as the power cable box.

Cable glands shall be either Nickel plate Brass or stainless steel 316 (metallic enclosures or armoured cables), or polyamide (Polyester enclosures and non armoured cables).

The connection diagram shall be indelibly marked on the terminal face of the cover.

6.12 Wiring

Wiring of auxiliary equipment on the transformers shall be securely fixed to prevent damage by vibration, excessive movement and other hazards. The fixing of wiring shall not make rigid any equipment or connecting boxes which have been specially mounted on resilient fixings.

Cables and wires shall be identified by permanent marking such as ferrules in line with the relevant wiring diagram.

6.13 Accessories

Transformers shall be equipped with accessories conform to [EN 50216](#), unless otherwise specified in project particular specification. The following shall be provided as a minimum:

6.13.1 Oil immersed breathing type transformers

- Drain valve, filling valve, filtering valve and sampling valve
- Oil level gauge with two auxiliary contacts (high and low level)
- Thermowell (for PT100 or other temperature measuring device)
- Dial thermometer
- Protection:
 - Buchholz relay
 - Thermostat
 - Overpressure relief device
- Two earthing terminals
- Lifting lugs or eye bolts.

6.13.2 Oil immersed hermetically sealed type transformers

- Drain valve and filling valve
- Pressure relief valve
- Thermowell (for PT100 or other temperature measuring device)
- Dial thermometer
- Protection:
 - Transformer relay providing the following functions:
 - . Overpressure
 - . Thermostat with two temperature thresholds
 - . Drop in liquid level.

For transformers installed in hazardous area, provision shall be made to prevent electrostatic discharges.

- Two earthing terminals
- Lifting lugs or eye bolts.

6.13.3 Dry type transformers

- Temperature indicator
- Thermal protection with alarm and trip contacts by means of thermistors or PT 100 resistance type temperature detectors (one measurement at least per phase)



- Two earthing terminals
- Lifting eye bolts.

6.13.4 Auxiliary control panels for cooling systems

Local panels shall be provided for monitoring and control of cooling fans and circulation pumps. All alarms and status shall be made available on voltage free contacts.

6.14 Neutral earthing

Transformers with star wound secondary shall have the star point brought out to a neutral terminal located on the transformer as indicated in the data sheet. All components shall be continuously rated to carry the maximum fault current indicated.

The neutral system will be specified in the data-sheet.

6.15 Parallel operation

Transformer of the same rating (power rating, voltage ratio, impedance, size and winding connection) shall be interchangeable and suitable for parallel operation.

6.16 Rating plate

Each transformer shall be provided with a stainless steel rating plate in accordance with IEC 60076-1.

6.17 Name plate

Each transformer shall be identified with a stainless steel name plate.

6.18 Labels

All items of equipment, i.e. transformers, connection boxes, panels, switches, devices, relays, controls, indicators, etc., shall be fully and clearly identified in accordance with the relevant drawings using engraved stainless steel or phenolic type labels.

Labels shall be fixed on non-removable parts using corrosion proof screws in order to avoid label loss after dismantling of equipment for maintenance purpose.

6.19 Handling

Each transformer shall have the suitable number lifting pads for complete handling and un-tanking operation as well.

7. Painting

Painting system shall be suitable for the site environmental conditions. The Coating shall comply with Company General Specification **GS EP COR 350** requirements. The Manufacturer may submit his coating system for protection against external corrosion for Company approval.

Proposed coating must be suitable for the category of corrosion defined for the site of installation as per **ISO 12944-2**, and shall provide a warranty of 5 years - with a rusting degree $R_i = 2$.

Atmospheric category of corrosivity of site of installation shall be defined on the data sheet:

Category	Description
C1	Very low corrosive atmosphere
C2	Low corrosive atmosphere
C3	Fairly corrosive atmosphere
C4	Highly corrosive atmosphere
C5-I	Atmosphere of very high corrosivity level (Industrial)
C5-M	Atmosphere of very high corrosivity level (marine) - Coastal, Offshore areas

Colour shall be Manufacturer's standard, unless otherwise specified in the project particular specification.

8. Testing and inspection

8.1 Qualification of Manufacturer

The Manufacturer shall provide the following test certificates with the bid for transformers of similar design as those required by the requisition.

- Temperature rise tests
- Short circuit test
- Lightning impulse withstand test
- Partial discharge test.

8.2 Acceptance tests

The acceptance tests shall be performed by the Manufacturer in the presence of Company representative. These tests shall include for each transformer:

- Dimensional checks (terminal, overall dimensions, weight)
- Visual inspection (finish, painting, welds, sheet metal works, lighting bugs, terminal factoring, leaks and weeping, dehydrator, breather condition)
- Qualitative and quantitative check of the contractual technical documentation provided with the transformer
- Comparative check of the transformer, auxiliaries and accessories according to the specification data
- Check of the rating plates and any additional markings and labels required by the specifications
- Electrical tests: Routine tests shall be performed for each transformer as per [IEC 60 076-1](#)
- For special applications (generator step-up transformer, converter transformer, etc.) dielectric oil shall be tested as per [CIGRE TF A2.32.01](#)
- For one transformer from a series of several ones: temperature rise test, when required



- Calibration checks of all instruments
- Functional check of tap changers and accessories.

8.3 Tests reports

A test report form shall be submitted to Company which shall include:

- The design values
- The tolerance values
- The real values as measured, including, if any, the intermediate values causing provisional refusal.

The reports shall be included in the contractual technical documentation of which they form an integral part.

9. Documentation

As a minimum and unless defined in a project particular specification, the following drawings and documentation shall be supplied in a timely manner according to the specified schedule:

- Transformer overall arrangements
- Completed Data sheet
- Foundation guide details if required
- List of ac consumers
- Arrangement details of auxiliary equipment
- Layout of connection boxes and control panels
- Wiring and termination diagrams
- Schematic diagrams
- Equipment technical details
- Operation and maintenance manuals
- Detail drawings of all interface points
- Type test report
- Dielectric oil type test certificate as per [CIGRE TF A2.32.01](#)
- FAT report
- Intrinsically safe circuits calculation note (if any)
- The EC declaration of Conformity, accompanied by
 - The transformer type examination certificates (or "Statement of compliance) delivered by a Notified Body.
 - The EC type examination certificates (or "Statement of compliance) of accessories, delivered by a Notified Body.



- IECEx Certificate of Conformity (CoC - delivered by an Ex Certification Body (ExCB) as defined in § 6.2.1 of **GS EP ELE 079**) for each individual electrical equipment.

10. Other references

Following documents are applicable:

- Standards: IEC 60076 (Parts 2; 3; 4; 5; 7; 8; 10; 12; 13; 14), IEC 60085, IEC 60099, IEC 60152, IEC 60214 (Parts 1; 2), IEC 60296, IEC 60445, IEC 60529, IEC 60616, IEC 60815, IEC 61099, IEC 62262



Appendix 1 Data Sheet Power Transformer



Exploration & Production

DATA SHEET

ELECTRICAL

DS EP ELE 141

POWER TRANSFORMER

5	01/2012	General review
Revision	Date	Notes

Owner: EP/DEV/TEC		Managing entity: EP/DEV/TEC/ELE
-------------------	--	---------------------------------



Exploration & Production

General Specification

Date : 01/2012

GS EP ELE 141

Rev : 06

Appendix 1

 TOTAL Exploration & Production		COMPANY PROJECT NAME DATA SHEET POWER TRANSFORMER					
						DSEPELE141-rev5	
Project Doc. number:		Contractor Doc N°:		Page 1 / 6			
Valid for :		☒ Call for Tender		☐ Order		Revision	
						Date	
Revision	Reason for issue	Date	By:	Checked by:	Approved by:		
1	rev	GENERAL DATA					
2		Tag number		Quantity:			
3		Site		Location			
4		Material Requisition No:		Project Specifications:			
5		Supplier Refn° :		Manufacturer Ref n°:			
6		ENVIRONMENTAL CONDITIONS					
7		Installation :		Environment class of corrosion			
8		Altitude (if>1000m)		m		Hazardous area classification:	
9		Min. Ambient temperature:		°C		Explosion group	
10		Max. Ambient temperature:		°C		Temperature Class	
11		Yearly average ambient temperature		°C		Relative Humidity @Max operating temperature:	
12		Monthly average ambient temperature		°C		Relative Humidity @Min operating temperature:	
13						%	
14						%	
15						W/m²	
16		POWER SUPPLY SYSTEM					
17		Network rated Voltage :		kV		Network rated Frequency	
18						Hz	
19		Network Neutral system				Earth fault current limitation:	
20						A s	
21		Network 3 Phases Max. Fault Level:		kA		DC available Auxiliary Voltages:	
22						V ± %	
23		AC available Auxiliary Voltages:		V ± %		V ± %	
24							
25		PARTICULAR OPERATING CONDITIONS					
26		Parallel operation				Rated power of largest DOL starting motor	
27						kW SC/FLD	
28		Total Harmonic distortion THD		%		Ih H5 % H7 % H11 % H13 %	
29		Cooling water network (for _FWF transformers)				Max water inlet temperature	
30						°C Operating pressure	
31						b	
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							
64							
65							
66							
67							
68							
69							
70							
71							
72							
73							
74							
75							
76							
77							
78							
79							
80							
81							
82							
83							
84							
85							
86							
87							
88							
89							
90							
91							
92							
93							
94							
95							
96							
97							
98							
99							
100							

 TOTAL Exploration & Production		COMPANY PROJECT NAME DATA SHEET POWER TRANSFORMER					
						DSEPELE141-rev5	
Project Doc. number:		Contractor Doc N°:		Page		2 / 6	
Valid for :		☒ Call for Tender		☐ Order		Revision	
Supplier		Manufacturer:		Ref:			
1	rev	Item	Required	Proposal	Comment		
2		TECHNICAL CHARACTERISTICS					
3		Rated Power	kVA	kVA			
4		Rated Power secondary windings (if >2windings)	kVA	kVA			
5		Vector Group					
6		Voltage Impedance	%	%			
7		Transformer type					
8		Dielectric fluid					
9		Cooling					
10		Electrostatic screen					
11		Dry type insulation	Primary	Primary			
12			Secondary	Secondary			
13		Windings		Primary			
14				Secondary			
15		PRIMARY SIDE CHARACTERISTICS					
16		Rated Voltage	kV	kV			
17		Neutral point brought out					
18		Power connection type					
19		Surge arresters on Primary side terminals					
20		SECONDARY SIDE CHARACTERISTICS					
21		Rated Voltage	kV	kV			
22		Neutral earthing system					
23		Fault current limitation	A / s				
24		Neutral point brought out					
25		Surge arresters on secondary side neutral in terminal box					
26		TAP CHANGER					
27		Tap changer type					
28		Tapped winding					
29		Number of Taps/Tapping range					
30		OLTC model			documentation to be provided		
31		OLTC Control relay			documentation to be provided		
32		OLTC protective relay			documentation to be provided		

		COMPANY PROJECT NAME DATA SHEET POWER TRANSFORMER				DSEPELE141-rev5
Project Doc. number:		Contractor Doc N°:		Page 3 / 6		
Valid for :		☒ Call for Tender		☐ Order		
Supplier:		Manufacturer:		Ref:		
1	rev	Item	Required	Proposal	Comment	
2		TANK - RADIATORS - CONSERVATOR				
3		Tank type				
4		Tank external coating				
5		Tank internal coating				
6		Radiators coating				
7		Radiators isolated by valves				
8		Drain and sampling valve with connector				
9		Conservator				
10		Dielectric level detector				
11		Air dryer				
12		Gaz detector isolating valves				
13		Filling valve				
14		Pressure relief valve				
15		Sealing of tank cover EEx"o"				
16		Tank isolated from earth				
17		HEAT EXCHANGERS				
18		Construction type				
19		Material				
20						
21		ACCESSORIES				
22		Earthing terminals	YES	Quantity: 2		
23		Key locking of tap changer and plug-in terminals				
24		Rating plate SS316L				
25		Lifting eye bolts				
26		Lifting Jack pads				
27		Travelling wheels				
28		Provision for Fan mounting				
29		Other				
30						
31						
32						
33						



Exploration & Production

General Specification

Date : 01/2012

GS EP ELE 141

Rev : 06

Appendix 1

 TOTAL Exploration & Production		COMPANY PROJECT NAME DATA SHEET POWER TRANSFORMER				DSEPELE141-rev5
Project Doc. number:		Contractor Doc N°:		Page 4 / 6		
Valid for :		☒ Call for Tender		☐ Order	Revision	
Supplier		Manufacturer:		Ref:		
1	rev	Item	Required	Proposal	Comment	
2		MEASUREMENTS AND PROTECTION				
3		Dial thermometer	Quantity:			
4		Pressure gauge	Quantity:			
5		Bucholz 2 thresholds				
6		Thermostat 2 thresholds - with contacts NO/NC				
7		Pressure switch 2 thresholds - with contacts NO/NC				
8		Multifunction relay				
9		Temperature probes RTD's	Quantity:			
10		Spare thermowell	Quantity:			
11		OLTC relay				
12		Core balance CT				
13		Supply of Intrinsic Safety barriers				
14						
15						
16		TESTS				
17		FAT				
18		SAT				
19		Routine tests	As per IEC 60076			
20		Temperature Riste test				
21		Pressure/vacuum test certificate of the tank				
22		Noise level measurement				
23		Other tests				
24						
25						
26						
27						
28						

 TOTAL Exploration & Production		COMPANY PROJECT NAME DATA SHEET POWER TRANSFORMER					
						DSEPELE141-rev5	
Project Doc. number:				Contractor Doc N°:		Page 5 / 6	
Valid for :		☐ Call for Tender		☐ Order		Revision	
						Date	
Supplier				Manufacturer:		Ref.	
1	rev	Item	Required	Item	Required	proposal	
2		TRANSFORMER POWER CONNECTION PRIMARY SIDE					
3		Connection		Type of cable			
4		Phase core cross section	mm ² Cu	core cross section (Neutral)	mm ² Cu		
5		Diameter on insulation (Phase)	mm	Diameter on insulation (Neutral)	mm		
6		Diameter on armour	mm	Diameter on armour (Neutral)	mm		
7		Outer Diameter (Phase)	mm	Outer Diameter (Neutral)	mm		
8		Bushings		IP 55 box with cable glands			
9		Plug in terminal type		Mobile part supplied			
10							
11							
12							
13		TRANSFORMER POWER CONNECTION SECONDARY SIDE					
14		Connection		Type of cable			
15		Phase core cross section	mm ² Cu	core cross section (Neutral)	mm ² Cu		
16		Diameter on insulation (Phase)	mm	Diameter on insulation (Neutral)	mm		
17		Diameter on armour	mm	Diameter on armour (Neutral)	mm		
18		Outer Diameter (Phase)	mm	Outer Diameter (Neutral)	mm		
19		Bushings		IP 55 box with cable glands			
20		Plug in terminal type		Mobile part supplied			
21							
22							
23							
24							
25							
26							
27							



Exploration & Production

General Specification

Date : 01/2012

GS EP ELE 141

Rev : 06

Appendix 1

TOTAL Exploration & Production		COMPANY PROJECT NAME DATA SHEET POWER TRANSFORMER				DSEPELE141-rev5	
		Project Doc. number: _____		Contractor Doc N°: _____		Page 6 / 6	
Valid for : ☐ Call for Tender ☐ Order		Revision _____		Date _____			
Supplier _____		Manufacturer: _____		Ref: _____			
TRANSFORMER DATA (TO BE COMPLETED BY MANUFACTURER)							
1							
2	Joules losses at rated current	kW					
3	No load losses	kW					
4	Magnetic circuit	Induction level (Tesla)					
5	Efficiency at PF=0.8 at load:	4/4		%			
6		3/4		%			
7		2/4		%			
8		1/4		%			
9	Voltage drop at: PF=0.8 at load:	4/4		%			
10		3/4		%			
11		2/4		%			
12		1/4		%			
13	Inrush current	Amperes					
14	Guaranteed temperature rise at 100% load	Windings		K			
15		Dielectric		K			
16	Mode of protection and ingress protection index of auxiliary devices	Thermostats			IP		
17		Pressure switches			IP		
18		Bucholz			IP		
19		Multifunction relays			IP		
20		Auxiliary junction boxes			IP		
21		Cooling Fans			IP		
22		Auxiliary panels			IP		
23	Transformer with Forced air cooling (xxAF)	Number of fans					
24		Fan motor rating kW					
25		Maximum power in xxAF mode kVA					
26		Maximum power in xxAN mode kVA					
27	Transformer with forced circulation of cooling water	Cooling water flowrate m3/h					
28		Max Water inlet temp °C					
29		Max water outlet temp at 4/4 °C					
30		Max water outlet temp at 2/4 °C					
31	Transformer with forced circulation of dielectric	Number of dielectric circ. pumps					
32		Circulation pumps motor rating kW					
33	Weights	Total kg					
34		Dielectric kg					
35		Untanking kg					
36		Radiators or exchangers kg					
37	Overall dimension	Length		mm			
38		Width		mm			
39		Height		mm			
40	Painting	Conform to project specification: _____					
41		Manufacturer specifications: _____					
42		Rusting degree after 5 years Ri : _____					
43	CE Marking / additional marking						
44		Certificate N° _____					
45	List of Deviations to Project specifications / Additionnal information.						
46							
47							
48							



Appendix 2 Data Sheet Earthing transformer



Exploration & Production

General Specification

Date : 01/2012

GS EP ELE 141

Rev : 06

Appendix 2



Exploration & Production

DATA SHEET	N°
Project:	
DS EP ELE 145	Earthing transformer
Rev. 02 - 10/05	

Rev. Date						
Written						
Verified						
Approved						

1						
2	REPERE(S) DU GENERATEUR HOMOPOLAIRE			Nb de générateurs homopolaires :		
3	TAG OF THE EARTHING TRANSFORMER			Number of earthing transformers		
4						
5	Lieu d'installation					
6	Site					
7						
8	CONDITIONS GENERALES D'INSTALLATION DU TRANSFORMATEUR					
9	GENERAL SPECIFICATION					
10						
11	Température ambiante :	Moyenne annuelle		Maximum		Minimum
12	Température of ambient air:	Yearly average		Maximum		Minimum
13						
14	Soumis aux rayonnements :	Solaire	Nombre h/jour	Nombre j/an	Torche	
15	Subject to radiations	Solar	Hours by day	Days by year	Flare	
16						
17	Altitude (si valeur excédant 1000 m) :			Hygrométrie		A l'abri des vents :
18	Altitude (if value exceeding 1000 m above sea level)			Humidity		Wind sheltered
19						
20	Atmosphère corrosive :		Embruns salins	H ₂ S	Autre	
21	Corrosive atmosphere		Sea spray		Other	
22						
23	Localisation :	Hors zone	Extérieur	Intérieur	On-shore	Off-shore
24	Location	Safe area	Outdoor	Indoor	On-shore	Off-shore
25						
26		Zone 2	Groupe d'explosion	Température maxi de surface		
27		Area 2	Explosion group	Maximum surface temperature		
28						
29	REPERE(S) DE LA RESISTANCE :					
30	TAG OF THE RESISTOR					
31						
32	CONDITIONS GENERALES D'INSTALLATION DE LA RESISTANCE					
33	GENERAL SPECIFICATIONS					
34						
35	Température ambiante	Minimum		Maximum		
36	Température of ambient air	Minimum		Maximum		
37						
38		Hygrométrie				
39		Humidity				
40						
41	Soumis aux rayonnements :	Solaire	Nombre h/jour	Nombre j/an	Torche	
42	Subject to radiations	Solar	Hours by day	Days by year	Flare	
43						
44						
45	Atmosphère corrosive :		Embruns salins	H ₂ S	Autre	
46	Corrosive atmosphere		Sea spray		Other	
47						
48						
49	Location :	Zone 2	hors zone	Extérieur	Intérieur	On-shore
50	Location	Area 2	safe area	Outdoor	Indoor	On-shore
51						
52	NORMES INTERNATIONALES APPLICABLES					
53	INTERNATIONAL STANDARDS					
54						
55	IEC 60076, IEC 60079, IEC 60137, IEC 60214, IEC 60354, IEC 60529, IEC 60551, IEC 60606, IEC 60726, IEC 60815, IEC 60905					
56						

This document is the property of Total. It must not be stored, reproduced or disclosed to others without written authorisation from the Company.

This document is the property of Total. It must not be stored, reproduced or disclosed to others without written authorisation from the Company.



Exploration & Production

General Specification

Date : 01/2012

GS EP ELE 141

Rev : 06

Appendix 2



Exploration & Production

DATA SHEET	N°
Project:	
DS EP ELE 145	Earthing transformer
Rev. 02 - 10/05	

APPEL D'OFFRE/CALL FOR TENDER		☐ COMMANDE/OFFER		Rév. : _____ Date _____	
1					
2	CARACTERISTIQUES GENERALES				
3	<i>GENERAL CHARACTERISTICS</i>				
4					
5	Tension du réseau à protéger :		kV	Fréquence	
6	<i>Rated voltage of the network to protect</i>			<i>Frequency</i>	Hz
7					
8	Courant de défaut permanent admissible		A	Limitation du courant de défaut franc	
9	<i>Permanent fault current permitted</i>			<i>Straight fault current limitation</i>	A
10					
11					
12	Nature des bobinages du transformateur	Cuivre	☐	Aluminium	☐
13	<i>Windings of the transformer</i>	<i>Copper</i>		<i>Aluminium</i>	
14					
15	Type de transformateur	Sec	☐	Classe d'isolement	☐
16	<i>Transformer type</i>	<i>Dry</i>		<i>Insulation class</i>	<i>Classe d'échauffement</i>
17					<i>Temperature rise class</i>
18				Degré de protection	
19				<i>Degree of protection</i>	IP
20					
21	Immergé	☐		Diélectrique	
22	<i>Immersed</i>			<i>Dielectric</i>	
23					
24	Mode de refroidissement	ONAN	☐	Autre	
25	<i>Type of cooling</i>			<i>Other</i>	
26					
27					
28	Peinture	Standard fournisseur	☐	Autre	
29	<i>Painting system</i>	<i>Standard</i>		<i>Other</i>	
30					
31					
32	CARACTERISTIQUES DU PRIMAIRE				
33	<i>PRIMARY SIDE SPECIFICATION</i>				
34					
35					
36	Raccordements puissance				
37	<i>Power connections</i>				
38					
39	Traversées porcelaines	☐			
40	<i>Porcelain terminals</i>				
41					
42	Bornes embrochables	☐	Partie mobile fournie	☐	Droite
43	<i>Plugs-in</i>		<i>Moving part supplied</i>		<i>Straight</i>
44					Equerre
45					<i>Elbow</i>
46	Câbles Type		Unipolaire	☐	Tripolaire
47	<i>Cables: Type</i>		<i>Single-core</i>		<i>Three-core</i>
48					Section
49					
50	Neutre	☐	Section		mm ²
51	<i>Neutral</i>		<i>Section</i>		
52				Diamètre sur gaine d'étanchéité :	
53				<i>Outer diameter</i>	mm
54	CARACTERISTIQUES DU SECONDAIRE				
55	<i>SECONDARY SIDE SPECIFICATIONS</i>				
56	Bornes de raccordement à la résistance				
57	<i>Terminals for the resistance connection</i>				
58					
59	Passe barres en caisson IP55 avec PE bronze				
60	<i>Throughway bushings inside IP55 box with brass cable gland</i>				
61					
62					
63					



Exploration & Production

General Specification

Date : 01/2012

GS EP ELE 141

Rev : 06

Appendix 2



Exploration & Production

DATA SHEET	N°
Project:	
DS EP ELE 145	Earthing transformer
Rev. 02 - 10/05	

APPEL D'OFFRE/CALL FOR TENDER		☐	COMMANDE OFFER		☐
1					
2	CUVE				
3	TANK				
4					
5	Cuve remplissage intégral	☐	Cuve formant radiateur ou avec ondes :		
6	Full filled tank		Corrugated tank		
7					
8	Cuve galvanisée à chaud :	☐	Cuve Inox 316 L :		
9	Hot-dip galvanised tank		Stainless steel tank 316 L		
10					
11	Vannes de vidange et prise d'échantillons avec raccord	☐			
12	Drain and sample valve with connector				
13					
14	Contrôle du niveau du diélectrique/Dielectric level control	☐			
15					
16	Vanne de vidange	☐	Vanne de remplissage	☐	
17	Drain valve		Filling valve		
18					
19	Plaque signalétique suivant IEC 76-1 :	☐	Plaque and visserie Inox 316		
20	Rating plate following IEC 76-1		MFR's plate and screw in 316 stainless steel		
21					
22	ACCESSOIRES				
23	ACCESSORIES				
24					
25	Bornes de mise à la terre	☐	Nombre		
26	Earthing terminals		Number		
27					
28	Manomètre	☐	Thermomètre :		
29	Pressure meter		Thermometer		
30					
31	Thermostat seuil 1 :	NO/NF	☐	Thermostat seuil 2 :	NO/NF
32	Temperature switch level 1	NO/NC		Temperature switch level 2	NO/NC
33					
34	Pressostat	NO/NF	☐	Détection de dégagement gazeux :	NO/NF
35	Pressure switch	NO/NC		Gas detector	NO/NC
36					
37	Mode de sûreté pour les accessoires :	anti déflagrant	☐	sécurité intrinsèque	☐
38	Protection mode	explosion proof		intrinsic safety	
39					
40	Degré de protection	IP			
41	Degree of protection				
42					
43	Anneaux de levage	☐	Galets de roulement orientables	☐	Galets isolés de la cuve
44	Lifting lugs		Adjustable casters		Casters isolated from the tank
45					
46	RESISTANCE				
47	RESISTOR				
48					
49	Sous enveloppe :	En acier galvanisé non peint	☐	En acier inox 316 L	☐
50	With casing	Made in galvanized sheet metal unpainted		Made in stainless steel 316 L	
51					
52	Degré de protection de l'enveloppe	IP			
53	Degree of protection of the casing				
54					
55	ESSAIS				
56	TESTS				
57					
58	Selon IEC				
59	According to IEC				



Exploration & Production

General Specification

Date : 01/2012

GS EP ELE 141

Rev : 06

Appendix 2



Exploration & Production

DATA SHEET	N°
Project:	
DS EP ELE 145	Earthing transformer
Rev. 02 - 10/05	

APPEL D'OFFRE/CALL FOR TENDER ☐		COMMANDE/OFFER ☐	
1			
2	INFORMATIONS A FOURNIR PAR LE CONSTRUCTEUR		
3	<i>INFORMATIONS TO BE PROVIDED BY THE SUPPLIER'S</i>		
4			
5	Nom du constructeur	Empattement des galets	☐ cm
6	Manufacturer's name	Caster track	
7			
8	Couplage des enroulements primaires	Couplage des enroulements secondaires	
9	Primary coupling	Secondary coupling	
10			
11	Tension aux bornes de la résistance sur défaut franc		V
12	Voltage at the resistor terminals on dead fault		
13			
14	Transformateur		
15	Transformer		
16			
17	Encombres (cm) :	L	I
18	Overall dimensions	L	I
19			H
20	Poids total	Poids à décuver	Diélectrique
21	Total weight	Untanking weight	Dielectric
22			
23			
24	Résistance		
25	Resistor		
26			
27	Encombres (cm) :	L	I
28	Overall dimensions	L	I
29			H
30	Poids total		
31	Total weight		
32			
33	Liaison transformateur-résistance		
34	Transformer-resistor linkage		
35			
36	Type	Section	mm ²
37	Type		
38			