



Exploration & Production

GENERAL SPECIFICATION

GEOMATICS

GS EP POS 001

Offshore Surface Positioning Works

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1. Scope

The objective of this Specification is to ensure that Company surface positioning requirements are met during offshore operations.

Additionally the objective of this Specification is to provide reliable three-dimensional positioning for operations conducted by Company, for any Survey, inspection, installation, rig positioning operations.

This Specification is to be used in conjunction with the other documents referred to in section 2 as well as the Company Project Specification.

2. Reference documents

The reference documents listed below shall be considered by Contractor, as 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.

All documents referred to in this section shall be considered as the latest versions and it shall be Contractor's responsibility to ensure that Contractor is in possession of these particular documents and that any qualifications are valid.

Standards

Reference	Title
ISO/TS 29001:2010	Quality management system requirements for the design, development, production, installation and service of products for the petroleum, petrochemical and natural gas industries, based on ISO 9001:2010

Professional Documents

Reference	Title
UKOOA Guidelines	Guidelines for the Measurement of Quality and Basic Quality Control of Offshore Positioning Data, published by the UKOOA Survey and Positioning Committee, June 1992
UKOOA Guidelines	Guidelines for the use of DGPS for offshore surveying. Guidelines documents published by UKOOA in October 1994
UKOOA P2/94	Recommended format for recording of raw offshore navigation data which is an extension of the existing P2/91 format with additional records for raw GPS data and associated pseudo-range corrections



Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
Not applicable	

Other documents

Reference	Title
Not applicable	

Total General Specifications

Reference	Title
GS EP POS 004	The Use of Differential Global Positioning System

3. Scope of work

Contractor shall carry out all positioning tasks of the project, on a highly professional manner, in accordance with industry standard, current surveying practice and to the satisfaction of the Company. Contractor shall carry out the positioning tasks with fully qualified personnel and state of the art equipment, fully calibrated and in perfect working order. Contractor shall retain its equipment and personnel for the exclusive use of Company for the duration of the positioning operations.

3.1 Surface Positioning systems

Contractor shall ensure that all specified navigation and positioning equipment including computer hardware and software are installed, fully calibrated and operational. The positioning work shall only commence with all systems approved by Company.

In all case, Contractor shall supply at the minimum, 2 fully independent positioning systems each of which providing sufficient redundancy and quality control output in order to insure that positioning is made within the required accuracy. Minimum one system shall be based on dual frequency DGPS System. During period with high solar activity, dual frequency shall be a standard requirement as well as the use of additional HF/ radio-link correction delivery solutions.

When two DGPS positioning systems are used, these systems **shall be each other fully independent**, based on different correction system and will be designated as primary (typically the most accurate) and secondary systems. The delivery of the RTCM or Global corrections



shall be as independent as possible. All necessary spare parts, user and maintenance manuals shall be provided onboard the vessel.

The surface Positioning System selected by Contractor, shall allow to continuously provide a position during the required period of time and within the specified 2-sigma accuracy (defined as corresponding to a 95 % confidence level) anywhere in the desired area or zone of operations.

System accuracy (defined as the value corresponding to a 95 % confidence level) **shall be better than a 1 meter for both primary and secondary**, after corrections for pitch, roll and heading.

Surface accuracy budget calculation shall be included in Survey procedure and subject to Company approval. All Positioning system shall be validated using Health Check Method or calibrated immediately prior to operation relative to a shore referenced position confirmed by Land survey technique (or similar). Health check results shall be conforming to the above accuracy specification.

In addition, for operation located within 500m from a large structure (FPSO, Fixed structure, Drilling rig, others...), a fully calibrated and redundant Laser/radar tracking system may be required by Company. This equipment will be validated by cross comparison prior to the start of the operations.

Positioning and correction reception antennae shall be installed such that shadowing and reflections of the signals are minimised and that there is no interference from other transmitters. Every effort shall be made to install the GPS antenna at the highest point on the vessel.

Contractor shall measure all horizontal and vertical offsets prior to each operation, after each modification and at any other time on the request of the Company Representative. All 3-dimensional offsets to and from reference points on the vessel shall be physically measured using acceptable survey technique. All offsets and any changes shall be logged and displayed in the offset list forms and diagrams and updated in the navigation software.

For large structures (FPSO, FPU, RIG, Lay Barge,...) a complete dimensional control shall be carried-out onboard , in order to provide 3D-offsets between main reference points of the structure (centre of the FPSO, moon pool, antenna mast, fairleads, etc.).

All reference point positions shall be calculated in real-time after application of corrections due to both heading and pitch& roll.

True Orientation of the Surface unit, shall be monitored in real-time, using a fully calibrated survey grad gyrocompass. Bench calibration certificate shall be provided and misalignment shall be calculated prior to operation using commonly approved survey techniques. Corrections due to Heading shall be calculated in real time by navigation system.

Note that for Tug management system the use of fluxgate compass information may be approved based on global accuracy requirement.

In the case of the lack of availability of a second DGPS system, the necessity of using only one DGPS system shall be discussed as a deviation to this specification and shall be agreed by Company prior to mobilisation and operations. In any case, the proposed system shall provide sufficient redundancy and quality control output in order to ensure the positioning accuracy requirements are being met. This situation shall be covered by the Project Quality Plan.

The position differences between two independent DGPS systems shall be equal to less than the quadratic combination of the currently agreed accuracy for such systems (maximal value of 2 metres). The DGPS system shall allow the user of this service to position its offshore vessel continuously to better than 2 metres (at 95 % confidence level) anywhere in the survey area or



zone of operations based on the assumption that atmospheric conditions and Selective Availability are normal.

Performance of the positioning system shall be monitored in real time using state of the art Positioning QC software

All raw data will be time tagged to GPS or UTC time, logged in a format and on a medium agreed by Company.

Contractor shall ensure that all positioning tasks shall be covered by a specific Work Instruction or by the Project QC Activity Plan.

3.1.1 DGPS, GcGPS systems

Contractor shall follow the guidelines provided in the [UKOOA Guidelines](#) document itemised in section 3 as well as specification of document [GS EP POS 004](#).

3.1.2 RTK,

Contractor shall follow the guidelines provided in the [UKOOA Guidelines](#) document itemised in section 3 as well as Specification [GS EP POS 004](#).

3.1.3 RGPS

Where a RGPS system is provided for relative vector GPS positioning, the RGPS system shall form part of the simultaneous computation and where applicable adjustment of the surface positioning network.

The RGPS data shall be computed at every update.

RGPS telemetry shall be via radio link, and using more than one unique frequency per RGPS unit used at one time.

It shall be ensured that the PDOP for the RGPS positioning does not exceed 6. Where necessary, height aiding may be used providing that Contractor uses a Geoid - Ellipsoid separation model approved by Company. The maximum age of RGPS data shall be 30 seconds. The minimum number of observed satellites shall be 5 or 4 with height aiding (see also Specification [GS EP POS 004](#)).

3.1.4 Tug Management system

A Tug Management System (TMS) is required for all operation involving tugs (AHT) directed by a "tow master" during infield or mooring operations. TMS will allow monitoring and displaying all vessels working in conjunction with the positioning / mooring of a large floating structure. Such system is required for:

- FPSO/ FPU final tow and mooring installation (TMS Master system)
- The tugs working under the instructions of a tow Master (Remote TMS station)
- The support vessel for recovery and hook-up of mooring lines: FPSO, FPU (TMS Remote station)
- The support vessel of the recovery and hook-up of mooring lines: OOB (TMS Master station)
- The OOB (TMS Remote station)