

## Kinematic Verification and Calibration of DGNSS, Gyro and MRU

RIGOCAL has developed a cost efficient and safer system than the traditional methodology for the verification and calibration of the navigation and positioning systems of vessels operating in the oil & gas and renewable industries.

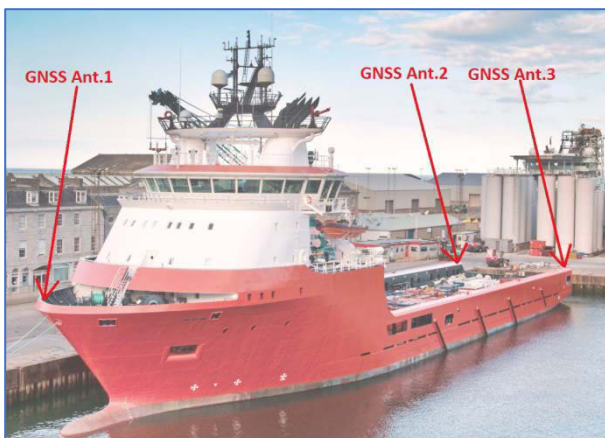
### Preface

As a standard, the offshore industry uses state-of-the-art technologies for navigating and positioning vessels involved in construction (CSVs), diving (DSVs), ROV inspection (ROVSVs) and other operations. These technologies, Differential GNSS (DGNSS), Gyrocompass and Motion Reference Unit (MRU), require regular check-ups (verification and calibration) to assess that they are not faulty and their accuracies are within the required tolerances set by the maker and regulators.

The conventional calibration technique requires the mobilisation of qualified personnel (usually two surveyors) and topographic equipment (tripods, GNSS receivers, total stations, prisms and poles) with the personnel having to move around the vessel, (e.g. climbing the mast) and on the quayside, with consequent safety constraints (Permit To Work, Toolbox and Risk Assessment requirements) and nominated off charter downtime of the vessel and evident loss of revenue to the ships' owner.

### RIGOCAL System KinCal™

KinCal™ is a new system developed by RIGOCAL, which achieves the same level of accuracy and quality of results of the conventional technique providing remarkable cost and time savings whilst mitigating potential safety incidents or operational constraints. KinCal™ requires only three dual-frequency GNSS receivers with internal data loggers, positioned respectively on screws which have been previously installed on the vessel with ease (image below).



The 3D offsets of the three screws relative to the vessel reference frame are measured only one time through a Total Station in order to ascertain their relative coordinates with millimetric precision.

RIGOCAL's system doesn't require any onshore Ground Control Point; instead KinCal™ utilises the Precise Point Positioning (PPP) technique integrated with our algorithm, achieving the required accuracy anytime and anywhere, without having long baselines as per the traditional GNSS positioning technique.

The procedure is intuitively straightforward and achievable without the need for qualified personnel. The three GNSS receivers are positioned on the three screws, and internally log the data for minimum 3 hours simultaneously to the positioning system of the vessel.

Any type of dual-frequency GNSS receivers with internal memory can be used by our Clients, reducing even the cost of sending our small case of GNSS receivers on board.

The logged set of data can be sent electronically (via email or shared folder) soon after the data acquisition to RIGOCAL's office, where they can be immediately QC'd and post-processed by the KinCal™ software and the C-O's are sent back to the vessel within 2 hours to be incorporated in the vessel positioning system. The full report will be issued within the following 6 hours.

The accuracy of KinCal™ is shown in the table below.

	Accuracy		
	DGNSS	Gyro	MRU
<b>KinCal™</b>	+/-0.05m	+/-0.05deg	+/-0.05deg

### Benefits of KinCal™

Compared to the conventional verification and calibration method, the advantages in using KinCal™ system can be summarised in the following points:

- Reduced mob/demob costs of personnel and bulky equipment (only the GNSS case, if required).
- Quicker and safer than traditional method.
- Can be performed anytime, day and night, and anywhere (even during navigation time).
- No need of specialised personnel.

KinCal™ has been tested against the traditional calibration technique and successfully utilised in over 30 verifications/calibrations to date.