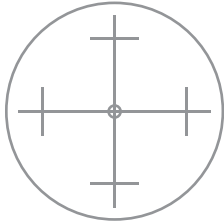


# GPS Global Positioning System

*Fast and reliable survey offshore and onshore*



## GPS Services

- Translation to EUREF89
- Unconstrained networks
- Set-out and data collection
- Terrain models
- Positioning
- Determining changes of position related to time
- Navigation
- C-pos

Parker Maritime AS, formerly Blom Maritime, was one of the first companies using GPS for commercial tasks. As early as in the mid eighties GPS was used for measuring subsidence of the Ekofisk oil field.



## Survey methods

The principle of GPS surveying is that base-lines between receivers are measured. The characteristic of Kinematic surveys is that one receiver is moving while the other is fixed. Real time surveys (RTK) use radio link for field communications. In Norway C-pos has replaced traditional kinematic surveying. C-pos is working independently of a traditional base station. A virtual base station is established from Statens kartverk at Hønefoss.

## Base points

GPS is a tool to establish a homogeneous and unconstrained network. An advantage is that there is no need for a direct line of sight between points as with conventional instruments. The measurements are always performed in closed polygons to obtain the highest possible quality and reliability.

## Terrain models

Terrain models can be measured with GPS either as RTK survey or as Kinematic (post-processed) survey. By setting the receiver to log data in a fixed time/distance mode or point measurements mode the survey can be performed continuously. The receiver can be mounted e.g. on a kind of vehicle. C-pos is also frequently used for this purpose.

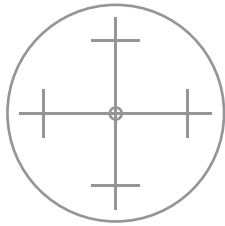


## Determining height by GPS

The GPS system measures heights referred to the WGS84 ellipsoid and can therefore be used for modelling the variation of the geoid. Within limited areas the geoid separation can be considered as constant. The orthometric heights can be determined by introducing the angle between the perpendicular of the ellipsoid and the plumb line of the geoid as an unknown parameter in the adjustment calculations and transformation. Parker Maritime AS is using the Norwegian Gemini NetGPS software for these calculations.

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### Detailed mapping

RTK is well suited for collecting data over large areas in a very short time. Requirement for detailed mapping can arise when there is no up-to-date maps available or where maps need to be renovated.

### Positioning

Parker Maritime AS uses GPS to position platforms where the distance to known points can be up to a 1000 km. Special techniques for measuring and calculating the results are used for such surveys. The relative accuracy is within a few cm.

### Navigation

GPS is often used for navigation and positioning. Differential GPS (DGPS) is used for ordinary navigation tasks inshore and offshore. RTK can be utilised for positioning in relation to mapping of harbours and other inshore operations where high accuracy is imperative. Today, C-pos is the main method onshore.



### SURVEY METHODS

| Method                      | Min. no. of sat. | Min. obs. time | Best achievable accuracy                      |
|-----------------------------|------------------|----------------|---|
| Static                      | 4                | 45-60 min      | H: 5mm + 1ppm, V: 10mm + 1ppm                 |
| Fast static                 | 4                | 8-45 min       | Between Static and Kinematic rel. to obs time |
| Post processed Kinematic    | 4                | 2 epochs       | H: 1cm + 1ppm, V: 2cm + 1ppm                  |
| Real Time (RTK)             | 5                | 1 epoch        | H: 1cm + 1ppm, V: 2cm + 1ppm                  |
| Post processed differential | 4                | 2 epochs       | 1-3 meter                                     |
| Real Time differential      | 4                | 1 epoch        | 1-3 meter                                     |

### OVERVIEW OF TRIMBLE MODELS IN PARKER MARITIME AS

Trimble 4800-receivers : All in one pole, no cables.  
Radio link, receiver and antenna in one unit.  
Internal memory.

Trimble 4700-receivers : Internal radio modem

Trimble 7400-receivers : Internal memory

Real Time survey (C-pos) is performed with Trimble field books . These are also used as storage medium on static surveys for the receivers with no internal memory. Raw data can also be stored directly on a PC.

Typical range for the radio links is up to 10 km. One or two extra radio links (repeaters) can be used to increase the range.

All the receivers can be used for RTK surveys with on the fly initialisation. All the receivers have nine channels and two frequencies. Several of the receivers have the possibility for RTCM input/output and NMEA output. In addition C-pos is used.



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