

GE  
Power Conversion

# SeaStream™

A new direction  
for DP



imagination at work

**ecomagination**

GE's SeaStream™ solutions are designed to enable management of multiple data streams with unprecedented flexibility for effective maritime operations.

Dynamic positioning (DP) is a computer-controlled system used to maintain a vessel's position and heading by automatically activating propellers and thrusters to counteract the displacing effects of the external environment.

Sensors provide information to the control system which incorporates a mathematical model of the vessel including information about the vessel's dynamics, its machinery and its responses to environmental and other displacing forces.

The model information together with the sensor data enables the DP system to calculate the required output for each thruster and propeller to achieve and maintain the desired position and heading.

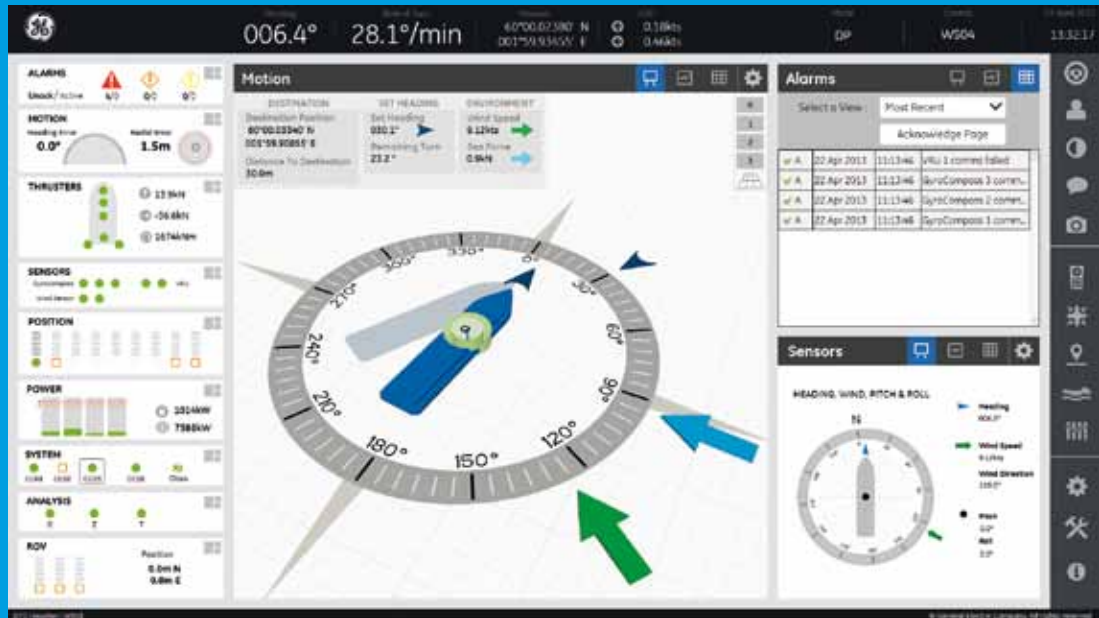


## The experience to redefine DP

We know DP, deeply. Since the 1970's we've built more than 800 systems, from joystick maneuvering and "simple" DP to multi-redundant DP and Thruster Assisted Mooring Systems (TAMS). Our technological range is coupled with front-line, hands-on expertise in all vessel types. No one is better positioned to develop the DP system you need.

By applying our engineering intelligence, and understanding your maritime operations, we've evolved DP to the next level. The result: a new range of DP systems developed to deliver the reliability, efficiency and effectiveness you demand.

**SeaStream™ DP**  
**It's a new direction in DP.**  
**It's the mariner's DP.**



## Unprecedented flexibility for effective maritime operations

### Putting the Operator in Control

SeaStream™, GE's latest range of DP systems is a mariner-focused solution, enhancing situational awareness and rebalancing attention from system management to true seamanship.

#### It delivers the following benefits:

- Unprecedented flexibility for effective maritime operations.
- An energy-efficient nautical system to reduce operational costs and emissions.
- A fully integrated system configured for optimum power & propulsion performance.

GE's new direction in DP control systems sets new standards of excellence in ship positioning and directly addresses the needs of ship owners, shipbuilders and DP operators.

This mariner-friendly package of controls and displays acknowledges the unique skills and high expectations of the mariners operating the system, allowing them to re-focus on seamanship and ship handling rather than becoming distracted by DP system management.

Side-by-side consultation at every level of the industry has guided the development and application of our advanced technology and control techniques. It's one of the ways we ensure that our DP systems integrate with and enhance the flexibility effective maritime operations.

The DP system provides a comfortable, reduced-stress working environment enabling the operator to fulfil his duties safely and efficiently.



## Features

## Benefits

Intuitive graphic interface

Easy to use – quick to learn for DP operators switching from other DP systems

26-inch touch sensitive multi-touch screen

Reduced need for data processing by operator; increased focus on seamanship

Configurable displays show data in clear and uncluttered form

Easier and faster system navigation

Operator/task specific information prioritization

Improved focus on positioning the vessel rather than manipulating the control system

Screen tilt angle adjustable

Enables standing or seated operation

Helps reduce screen reflections and glare

Screen display available in different language versions

Improved focus on the task in hand for non-English speakers

Slimline console design, at home on any vessel's bridge

Saves space and complements various bridge designs

Directly connects user with the wealth of features and improves access, interpretation and manipulation of all connected data and systems

Helps reduce potential operator error

Intuitive in operation in both routine and adverse operating conditions

Helps improve decision-making in routine and pressurized operating conditions

Suitable for use by operators with all levels of experience

Helps minimize the time taken for operators to become proficient in its use including speedy transition from other manufacturers' DP systems

A full range of system configurations

Adaptable to any configuration: Joystick, DP1, DP2, DP3 and Thruster Assisted Mooring

Comprehensive range of sensors including taut wire, GNSS, laser, radar, hydroacoustic, inertial platform, gyrocompass, wind sensor, motion reference unit etc.



## Simulated drillship example of fuel usage and NOx emissions

Wind speed (m/s)	Fuel used in "Normal DP" (kg/hr)	Fuel used in Energy Efficient mode - fixed heading (kg/hr)	Fuel used in Energy Efficient mode - optimum head" (kg/hr)
5	947	835	834
10	966	852	848
15	1011	905	887
20	1115	1017	970
<b>Weighted mean</b>	<b>971</b>	<b>860</b>	<b>854</b>

Table 1: Fuel usage at different wind speeds. 3600kW non DP load included

Wind speed (m/s)	NOx in "Normal DP" (kg/hr)	NOx in Energy Efficient mode - fixed head (kg/hr)	NOx in Energy Efficient mode - optimum head" (kg/hr)
5	24.5	18.8	18.7
10	24.8	19.5	19.3
15	27.3	22.2	21.2
20	32.9	29.4	26.3
<b>Weighted mean</b>	<b>25.4</b>	<b>20.0</b>	<b>19.6</b>

Table 2: NOx emissions at different wind speed. 3600kW non DP load included

Table 1 and Table 2 use the probabilities of the different wind speeds to produce a weighted mean figure, which reflects the average fuel and NOx rates over a one year period.

From Table 2 the mean fuel saving by using "Energy Efficient mode - fixed heading" is estimated as 11% of total, while in "Energy Efficient mode - optimum heading" the saving

is estimated at 12%. This equates to either 2664 kg or 2880 kg of fuel per day. The estimated annualised fuel saving equates to around \$ 0.8 million a year based on a bunker price of \$ 0.8/kg.

From Table 2 the NOx emissions are estimated as being reduced by about 5 kg/hr which equates to between 21% and 23%.



## GE as a full system integrator

### Positioning DP in the Big Picture

At GE, we see the whole ship. That's because we design and supply so much of it, from gas turbines and diesel engines to rotating machines, variable speed drives, drilling systems and automation and control. We power, propel and position the industry. As engineers with broad vision, we understand the role of the DP control system relative to the entire vessel's operations; its integrated role in a network involving power generation and distribution equipment, propulsion and maneuvering machinery, digital controllers, electrical systems and more.

GE's new SeaStream™ DP incorporates application-specific software to provide individually tailored solutions designed to meet the exact operational requirements of each ship. Operational requirements vary dramatically from ship to ship and GE's extensive library of solutions is available with task specific features and functions.

#### **Specialist DP application modules include facilities for:**

- Survey ships
- Cruise liners
- Cable lay/repair vessels
- Drilling vessels (drillships and semi-submersibles)
- Shuttle tankers
- Pipelaying vessels
- Platform Supply Vessels (PSVs)
- Dredgers
- Heavy lift vessels
- Offshore Support Vessels (OSVs)
- Naval ships

#### **Control modes and features**

Task specific control modes enable the ship to be maneuvered and positioned to best suit the needs of each individual maritime operation.

#### **Maneuvering**

- Hand Pilot
- Joystick Control with Manual Heading
- Joystick Control with Automatic Heading
- Autopilot



## Tracking

- **Autotrack** – High precision automatic tracking and heading control along a pre-defined track line using all selected thrusters.
- **Autosail** – High speed automatic tracking and heading control along a pre-defined track using the main propulsion and steering system.
- **ROV Follow** – Automatic tracking and heading control to follow a mobile beacon attached to an underwater vehicle or other object.
- **Ship Follow** – Automatic tracking and heading control to enable the DP vessel to track the relative movement and relative heading of another ship or other mobile structure.

- **Enhanced Ship Follow** – Automatic tracking and heading of fast-moving structures such as barges.

## Station Keeping

- **Auto Position (DP)** – Automatic position and heading control.
- **Autospeed** – Automatic fore/aft and port/starboard vessel speed control using the joystick plus an interface to a dual axis doppler log or GNSS. Autospeed provides an effective hover mode (zero speed in fore/aft and port/starboard axes) even in circumstances where primary position reference systems are unavailable.

## A class act – complying with regulations and guidelines

- Class 1** - In addition to the single DP system an independent back-up joystick system may be required. GE's joystick can optionally include DP functionality.
- Class 2** - No single equipment failure will render the system inoperable. GE can supply Class 2 compliant triple voting systems which exceed the regulatory minimums and provide an even higher level of overall system integrity.
- Class 3** - Triple redundancy in terms of equipment provision and an overall system design. GE's optional quad DP system solution exceeds the regulatory minimum levels of DP control system equipment redundancy to provide an even higher level of overall system integrity. In effect the system can be seen as a "Class 3 +" which positively impacts overall system availability.

The system meets all major classification society and regulatory requirements including Det Norske Veritas, Lloyd's Register of Shipping, Bureau Veritas, American Bureau of Shipping, Norsok, US Coast Guard and International Maritime Organization recommendations.

## And more: A focus on availability

We understand the vital importance of vessel availability—and our service focus keeps us actively engaged, both when things are going right, and when they go wrong.

### Diagnostics and Trending

GE's DP is designed for high fault tolerance and incorporates:

- Self-diagnostic routines
- Operator guidance and support to identify and resolve system errors
- Standard features such as an inbuilt multi-channel chart recorder and an optional dedicated history station/black box logger

### Remote Support

ViSor Connect is GE's remote diagnostic and support system based on highly secure satellite communications links.

ViSor Connect enables GE experts, regardless of their geographical location, to 'look over the shoulder' of the DP operator or technician physically at the equipment, and advise and assist on fault finding and resolution.

### After-Sales Service and Support

GE offers a wide range of after-sales service and support packages tailored to a single vessel or to an entire fleet. These packages are delivered via a world-wide network of support bases. Some of the key benefits of a GE support package are:

- Single point of contact
- Reduced call-out rates
- 24/7 support
- Rapid mobilization of engineers
- Routine maintenance visits
- Dry docking support
- Training
- System health checks
- Spares management
- Obsolescence management

GE also provides managed system upgrade paths for its 'legacy' systems and has significant experience of replacing systems from other manufacturers with a minimum of disruption to ship's infrastructure.



By Kind Permission Seacor Marine LLC

## MAIN OFFICES

**Australia**, Botany  
Tel: +61 (0) 2 8313 9980

**Brazil**, Minas Gerais  
Tel: +55 31 3330 5800

**Canada**, Mississauga  
Tel: +1 905 858 5100

**Chile**, Santiago  
Tel: +56 2 652 6500

**China**, Shanghai  
Tel: +86 21 6198 2600

**France**, Massy Cedex  
Tel: +33 1 77 31 20 00

**Germany**, Berlin  
Tel: +49 30 7622 0

**India**, Chennai  
Tel: +91 44 4968 0000

**Japan**, Tokyo  
Tel: +81 3 5544 3852

**Norway**, Oslo  
Tel: +47 67 83 82 50

**Russia**, Moscow  
Tel: +7 495 981 13 13

**Singapore**  
Tel: +65 6332 0940

**South Africa**, Midrand  
Tel: +2711237 0000

**South Korea**, Busan  
Tel: +82 51 710 9015

**UAE**, Dubai  
Tel: +971 44296161

**UK**, Rugby  
Tel: +44 1788 563 563

**USA**, Pittsburgh  
Tel: +1 412 967 0765



imagination at work

[www.gepowerconversion.com](http://www.gepowerconversion.com)

Copyright © 2015 General Electric Company and/or its affiliates. All rights reserved.  
GEA30753 A new direction for DP