



# PORTABLE DYNAMIC POSITIONING SYSTEMS

DIESEL HYDRAULIC  
POWER UNITS (HPU)

FULLY PORTABLE  
INSTALLED DOCKSIDE



DYNAMIC POSITIONING  
CONTROL VAN FULLY PRE-  
PACKAGED AND TESTED

MODULAR DECK MOUNTED  
360° AZIMUTHING THRUSTERS

MINIMAL AMOUNT OF  
DECK SPACE REQUIRED

*It's amazing what a little **imagination** can do!*

**Imagine** being able to take something as simple as a barge, and convert it into a highly sophisticated dynamically positioned vessel.

**NOW**, imagine this conversion being done dockside in the water, in less than a week.

Difficult you may ask? Impossible? Not here. Thrustmaster does it on a regular basis with great success. We call it the Portable Dynamic Positioning System (PDPS). It consists of modular thrusters, power units, and a DP control van all interfaced and ready-to-go.

Our deck-mounted system can be quickly installed without dry-docking, and without extensive modifications of the vessel so your vessel of opportunity can be ready to go with minimal conversion time.

Thrustmaster's Portable DP systems are available for ships and barges from 100 to 600 ft. (30-180m) in length and can be provided per DPS-0 to DPS-3 requirements of any Classification Society.



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A Thrustmaster Portable Dynamic Positioning System (PDPS) is installed on this 270x85x17 ft reel pipelay barge.

The system allows subsea pipelay installation many times faster than can be done with an anchor moored barge.

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## FEATURES AND BENEFITS OF THE PORTABLE DP SYSTEM

Feature	Benefit
<p>✓ Comes as a complete system with DP computers, sensors, thrusters, prime movers and support systems all fully integrated</p>	<p>No design studies, no system engineering, no shipyard, single source system responsibility. Saves time, money, and eliminates mismatches and compatibility issues between component suppliers. No finger pointing. Everything arrives in one shipment.</p>
<p>✓ Flexible DP system configuration. Easy upgrades to DPS-0 through DPS-3 with options for cable or pipelay software, follow ROV and electronic navigation chart display</p>	<p>Allows easy matching to project mission requirements with many options for future upgrades. Class certification available as required by contract or insurance carriers.</p>
<p>✓ Modular design, with thruster &amp; HPU modules available in 300, 500, 750, 1000, 1500, and 2000 HP Increments (220 - 1500kW)</p>	<p>Allows easy configuration to suit any size vessel or barge from 100 to 600 feet (30-180m) long, with freedom to place modules wherever space is available.</p>
<p>✓ Deck-mounted thrusters and power units</p>	<p>No vessel conversion needed to create new engine rooms for generator sets and thruster rooms for thru-hull thrusters. Saves lots of engineering design time and money. Eliminates the need for lengthy and expensive vessel conversion in dry-dock.</p>
<p>✓ Thrusters and power units are bolted to the deck or to platforms.</p>	<p>Allows quick and easy installation and removal dockside without dry-docking. Equipment does not become part of the vessel and can easily be used as a temporary enhancement of a leased or chartered vessel of opportunity.</p>
<p>✓ Power units are totally self-contained with radiator-cooled engines and hydraulics, built-in fuel day tank, critical muffler, battery powered start and control system with charging alternator and local control panel</p>	<p>No vessel utilities required. Each power unit is completely independent, fully unitized, and ready to start-up as delivered. Vessel DP conversion or mobilization can be accomplished within days.</p>
<p>✓ Thrusters are fully azimuthing and the hydraulic drive provides fully proportional propeller speed control with full torque available at any speed setting</p>	<p>Perfect thrust vectoring with fast and accurate response to control commands; ensures highly accurate vessel positioning capability.</p>
<p>✓ Thrusters use podded design concept. Propeller shaft is directly driven by hydraulic motor in the foot (or pod) of the thruster. The stem contains hydraulic hoses only</p>	<p>High propulsion efficiency, no gear losses. Very reliable due to its simplicity and limited number of moving parts. Allows the use of long stem lengths, as the stem does not contain drive shafts, bearings, or gears. Lateral and torsional critical speeds are far above operating speeds. Runs smooth, no vibration.</p>
<p>✓ Thrusters have hydraulic kick-up feature to tilt thrusters completely out of the water to deck level</p>	<p>Allows easy access to all parts of the thruster, including propeller to clear fouling. Dry-docking for thruster repair is never required. Allows vessel access to shallow ports. Allows vessel transit with thrusters stowed out of the water.</p>
<p>✓ Each thruster has its own dedicated power unit and controls as an independent, stand-alone package</p>	<p>True redundancy, no common points of failure. Very easy FMEA. No need for a power management system.</p>
<p>✓ Portable DP systems use only reputable worldwide component suppliers, such as Caterpillar or Cummins engines, Bosch-Rexroth or Sauer-Sundstrand hydraulics, and Kongsberg or similar DP systems.</p>	<p>High reliability with easy access to service and repair parts anywhere in the world.</p>
<p>✓ Systems are available for lease. (Proper credit, collateral, and insurance required)</p>	<p>Allows temporary use for a specific short-term project.</p>

# How the Thrustmaster

**Thrustmaster's Portable Dynamic Positioning System** is a computer-controlled propulsion system that allows a vessel to maintain its position in open waters against wind, waves and current. It can also direct a vessel to follow a predetermined track at a specified heading and speed, or follow an independent target such as an ROV or AUV.

Our PDPS consists of two or more azimuthing thrusters, each provided with its own diesel hydraulic power unit, and connected to a central van with prepackaged DP computers and sensor suite. Position reference sensors, combined with wind sensor and gyrocompass, continuously input data to the computer regarding the vessel's position, heading and wind forces. The computer calculates and commands each thruster's steering angle and thrust output necessary to control the vessel's position, heading, and speed.

Controls are all electric and cables between the sensors, the computer, and the diesel hydraulic power units (HPUs), as well as the hydraulic hoses between HPUs and thrusters are all part of the system.

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Thrustmaster thrusters are being mounted on platforms for operation on this vessel of opportunity. The freely azimuthing thrusters can position and hold the vessel to within a few feet of it's target.

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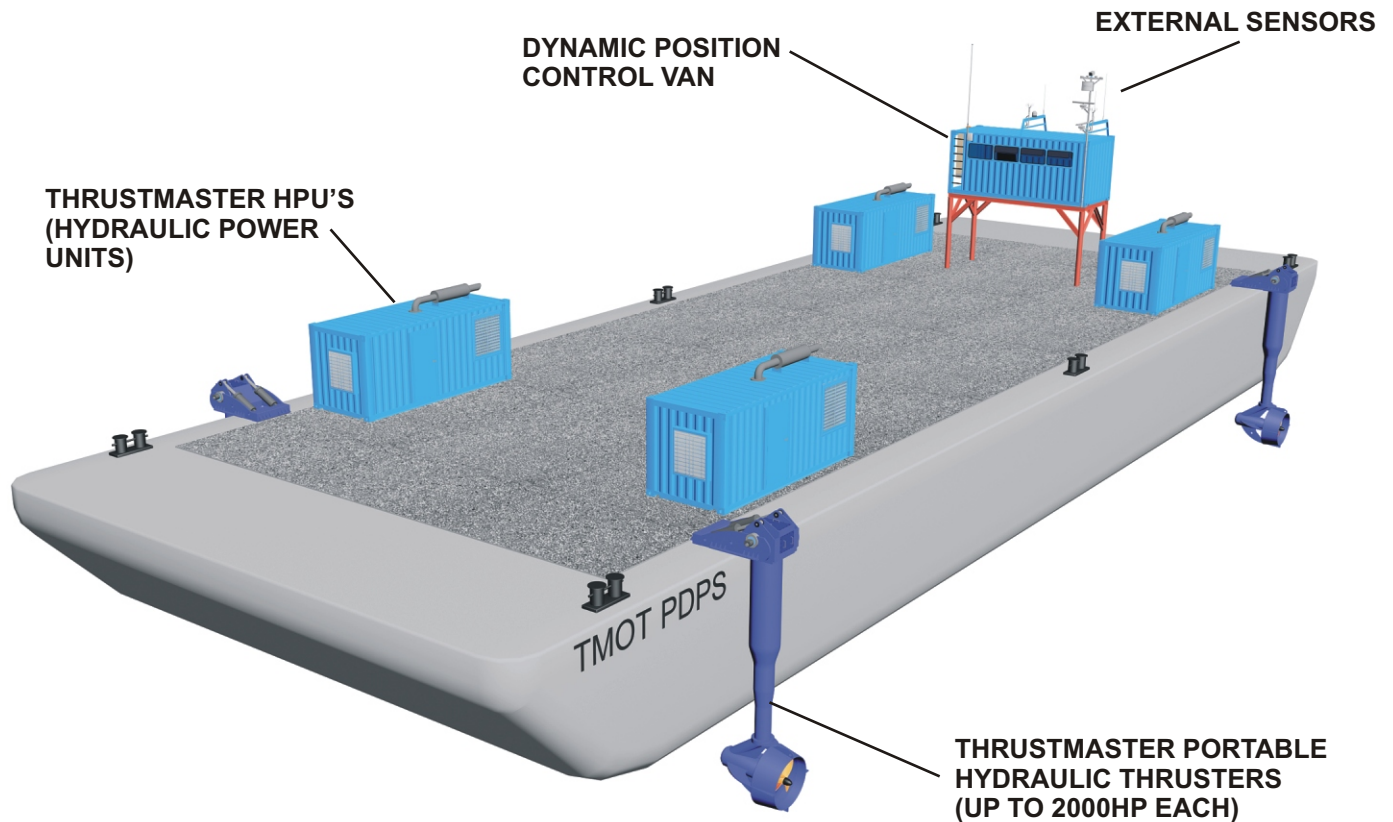
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Four OD2000N units along with their HPU's are prepared to be delivered to the Port of Houston for loading and delivery. These 2000 HP units are part of a PDPS system for offshore drilling operations in the Beaufort Sea.

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# Portable DP System works for you

## TYPICAL SYSTEM CONFIGURATION



Thrusters may be placed on deck or on sponson platforms welded to the shell. They may be deployed over the sides or over the bow and transom, or all on one side to reserve the opposite side for diving, ROV operations, pipelay or repair, etc.

Power units may be placed on deck or on elevated stands. In many cases, power units can be stacked on top of one another to save precious deck space.

The control van may be placed on top of the accommodations module or at another elevated location.

# A Variety Of DP Thruster Solutions



Standard thruster sizes used in the PDPS are 300HP, 500HP, 750HP, 1000HP, 1500HP, and 2000HP each. The thrusters are configured for mounting on deck, or on platforms welded to the side shell of the vessel. The stem and lower foot of the thruster are totally supported from the top assembly and there is no need for any lower support from the hull structure.

Each thruster is provided with a hydraulically powered swing-up system allowing the stem and lower foot to be tilted upward 90 degrees to a horizontal position at deck level. This facilitates easy propeller inspection or repair and allows for stowing of the thruster during transit or when the vessel is not in use.

A variable speed hydraulic motor in the foot of the thruster directly drives the propeller. It is a podded hydraulic drive, eliminating the need for right-angle gear transmissions and drive shafts used on conventional thrusters. The stem contains hydraulic hoses running from the deck-mounted upper thruster assembly down to the hydraulic motor in the foot. Other than hydraulic fluid running through these hoses, there are no moving parts in the thruster stem. This makes the thruster very reliable in spite of its long stem length. This stem length can be easily shortened or increased to accommodate different hull depths.

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Our 300hp thruster uses a 40-inch nozzle. Stem length from the deck mount skid to the propeller centerline can be any length up to 12-feet.

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These Thrustmaster 2000hp thrusters installed on an Arctic drilling rig are DNV approved for 1.5m ice floes with special low temperature materials.

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# Sizes To Fit Your Needs

Accurate control of thrust direction and magnitude is essential in DP applications. Thrust direction is controlled by steering the propeller. Each thruster can freely azimuth through 360 degrees without stops.

Regulating the speed of the fixed-pitch propeller controls the amount of thrust output. The closed-loop hydraulic drive facilitates precise propeller speed control from zero to maximum RPM. Full torque is available at any propeller speed, even at very slow RPM, allowing fast and precise response to speed command changes from the DP computer. This results in station keeping accuracy superior to what can be obtained using conventional diesel-electric driven DP thrusters.



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**Our 1000-hp thruster has a 64-inch nozzle and any stem length to 30-feet**

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The combination of a large Kaplan propeller in a hydrostatic system yields a high overall efficiency. It is more efficient than a diesel-electric system, especially at partial load conditions where a DP system normally operates.

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**The externally mounted thrusters can take repeated submergence without harm to the system.**

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# Hydraulic Power Units (HPU)

Each thruster comes with its own self-contained diesel hydraulic power unit (HPU). The HPU is fully enclosed and designed for outdoor installation at any convenient location directly on deck or on a raised platform. It produces the hydraulic power to drive the propeller, provide steering, and operate the swing-up functions of the thruster. This power is transmitted through hydraulic hoses running on deck from the HPU to the thruster.

The HPU comprises a continuously rated diesel engine (Caterpillar or equal), driving a heavy-duty hydrostatic transmission pump package with auxiliary hydraulic pumps.

The engine runs at constant speed, much like a generator. The radiator-cooled engine has a battery start and electric controls, alarms, shutdowns, and charging system. A fuel day tank for 12 hours operation at full load is included. The HPU is completely self contained and has its own local control panel for maintenance and service, or emergency backup.



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**HPU's are self-contained. Just place them on deck and they are ready to start.**

**HPU's can also be built to stack, saving deck space.**

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# DP Controls

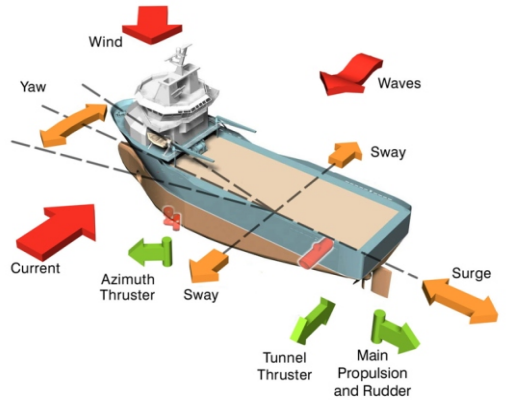
## FULL-RANGE OF DYNAMIC POSITION CAPABILITIES



The central control system of the PDPS is designed for installation on the bridge or in a dedicated control van.

Position sensors may include microwave or laser radar, DGPS, USBL, SBL, or LBL hydroacoustic, taut-wire, or any other industry standard positioning sensor suite.

Wind sensors, gyrocompass, and motion reference units are available as required for the vessel's mission. Options also include cable or pipelay software, follow ROV, and ECDIS navigation display.



Compliance with vessel classification rules or redundancy requirements are met as required. Thrustmaster PDPS are routinely classed by ABS, DNV and other classification societies on DPS-1, DPS-2, and DPS-3 classed vessels.

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Thrustmaster's dedicated control vans can be mounted directly onto the main deck, on platforms, or the top tier of any DP vessel superstructure.

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Climate controlled vans conform to customers specifications while being designed around the technical needs of Dynamic Positioning equipment.

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# System Integration



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The flexibility of the Thrustmaster PDPS system allows the thrusters to be mounted anywhere on the vessel without permanent changes to the hull. Note the six 1000HP Hydraulic Power Units on deck.

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Dynamic Positioning systems are complex and comprise many components and sub-systems.

Proper integration of all parts of the system requires a good understanding of the inter-dependence of all critical system components.

When ordering a Portable DP System from Thrustmaster you get a proven system fully integrated at the factory.

Thrusters, HPUs, DP computer and sensors are all carefully matched and optimized to operate in harmony as a system. It is tested as an integrated system at Thrustmaster's facilities prior to shipment, so there are no surprises.

Thrustmaster uses only the best quality components available. We work closely with all of our component suppliers and make them part of our team when it comes to system integration. All components are selected and configured for optimum functionality and reliability based on the DP system application parameters. Due regard is given to overall system efficiency, station-keeping accuracy and response times. Environmental factors are considered including the humid and corrosive offshore atmosphere, high ambient temperatures, vessel motions and wave impacts. All equipment complies with MARPOL pollution standards.

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This 220x54x13 foot deck barge used for cable laying is equipped with Thrustmaster's 4x500 HP portable DP system. This vessel has not had a single thruster or power unit failure since start-up in 1998.

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# Mobilization & Demobilization

*Install, Use, Store, Refit, or Permanent Installation*



Thrusters and HPU's can be delivered by vessel or over the road to their final destination.



Installation of thrusters and HPUs is accomplished dockside by the use of cranes, either shore-based or on the vessel.

The equipment is modular and can be trucked over-the-road or transported by ship or barge even to remote locations. Installation and mobilization can be accomplished in as little as a few days.

A Thrustmaster service technician oversees mobilization of the system. The service technician supervises installation, commissioning, start-up, and dock trials. Once the system is calibrated at the dock, a brief sea trial is required to test and fine-tune the system before the vessel is ready for complete operation.

Demobilization of the system is simple. The interconnecting hydraulic hoses and cables are removed, drained and packed. The thrusters, HPUs, and controls are removed from the vessel of opportunity and transferred to the next project vessel, or stored until needed.

One of four 1000hp thrusters is lifted by shore crane onto a barge being converted to PDPS service in Mobile, AL. Note the HPU mounted on the elevated stand. (upper right)



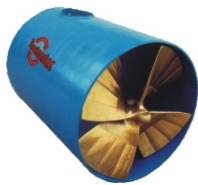
# About Thrustmaster of Texas, Inc.



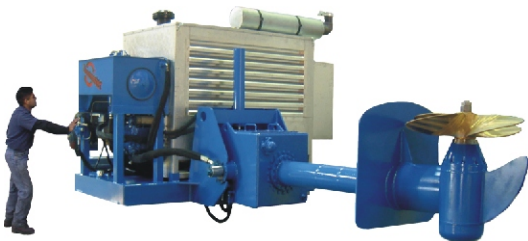
Founded over 20 years ago by its current president, Thrustmaster of Texas, Inc. is a privately-owned corporation based in Houston, Texas. As one of the world's leading manufacturers of marine propulsion equipment, Thrustmaster has maintained its reputation over the years by strict adherence to its mission statement of both quality and customer service.

Thrustmaster is ISO 9001 certified as determined by the ABS. Thrustmaster field service engineers and technicians provide worldwide support 24 hours a day. We maintain a large inventory of all essential spare parts in Houston, Texas, backed up by a computer controlled inventory system, ensuring same-day shipping of breakdown spares to any destination in the world.

## Other Thrustmaster of Texas, Inc. Products



Hydraulic tunnel thrusters range from 16" to 76" diameter and 35 to 2,000 HP and can be configured for aluminum or steel hulls. Hydraulic applications allow the primary power to be mounted anywhere on the vessel.



Workmaster and Thrustmaster Hydraulic Outboard units are fully self contained, portable deck mounted out-drives ranging from 75 to 2,000 HP.



Underwater demountable azimuthing thrusters for semi-submersible and large vessel applications are available up to 5000 kW.



Thru-hull azimuthing Z-drive and L-drive configured thrusters range from 75 to 6,000 HP. Z and L drives also come in fixed configurations for main propulsion systems where space considerations prohibit a thru-hull straight or reverse angle shaft.



Retractable azimuthing thrusters with variable speed electric or hydraulic drives are available in a range from 75 to 3,000 HP. Retractable thrusters can serve double duty as a tunnel thruster in retracted position, or for 360° DP station keeping in the extended position.

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