

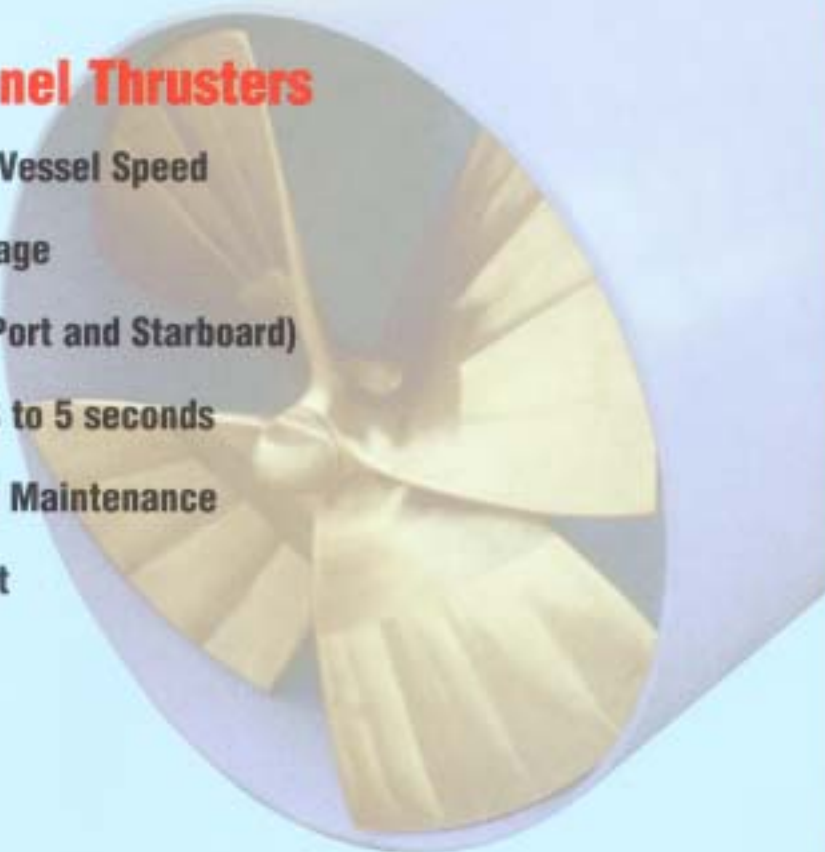
Hydraulic Tunnel Thrusters



Thrustmaster
of Texas, Inc.

Thrustmaster Tunnel Thrusters

- **Precise Control at Slow Vessel Speed**
- **Highly Resistant to Damage**
- **Infinite Thrust Control (Port and Starboard)**
- **Full Thrust Reversal in 3 to 5 seconds**
- **Few Rotating Parts; Low Maintenance**
- **Quiet, Reliable, Efficient**
- **Convenient Installation**



Precise Control When You Need it Most

Tunnel thrusters are primarily used for docking and undocking, slow speed maneuvering, emergency steering and station-keeping at zero or slow forward speed. Tunnel thrusters provide a significant advantage to vessels where adjustments in their heading at zero speed are critical to their operation, where maneuvering in tight quarters is required or where frequent docking occurs.

Thrustmaster hydraulic tunnel thrusters are available from 35 to 1,000 HP (25 to 750 kW) with tunnel diameters of 16 to 77 inches (400 to 1950 mm).

Tunnel thrusters are highly effective at very slow vessel speeds and are relatively inexpensive compared to other types of thrusters.



Smooth and Forgiving Hydraulic Drive

Thrustmaster of Texas, Inc., pioneered the concept of hydraulic propulsion for the marine industry using technology originally employed in the offshore oil fields. Thrustmaster's hydraulic bow and stern thrusters are the benchmark for efficient and reliable maneuvering under severe marine conditions.

The hydraulic drive is extremely resistant to damage. Foreign objects ingested by the tunnel, (a disastrous event with a mechanically-driven bow thruster) will not damage the hydraulic drive train, as the hydraulic system instantly relieves any transmission overloads.

The variable-flow hydrostatic drive system allows for infinite propeller speed control in port and starboard direction. This allows perfect vessel station-keeping as well as instant thrust response. Full thrust can be reversed within three to five seconds. This instantaneous and fully proportional speed control gives performance similar to a controllable pitch propeller (CPP) without the cost, complexity, fragility or maintenance problems of the intricate CPP control system with all its drive shafts, levers and feedback mechanisms.

Efficient and Reliable

Thrustmaster's hydraulic drive is simple, quiet, efficient and extremely smooth. The prime mover can be a non-reversible electric motor or an engine running at a constant speed because the hydraulic transmission controls propeller speed and direction of rotation. The prime mover drives a hydraulic pump. The propeller is driven by a hydraulic motor. In between are fluid conductors. There are no drive shafts, gears, bearings or other mechanical components to fail. The hydraulics are virtually maintenance free and provide years of reliable operation while performing in the harshest marine environments.

Many Thrustmaster tunnel thrusters have been in continuous commercial use for more than 10 years, providing flawless operation without any component failures.

There are very few rotating parts. The simple design of the direct hydraulic drive, without right angle gear transmission or drive shaft, provides for extreme reliability and very easy maintenance. There is no scheduled maintenance to the tunnel thruster other than normal maintenance to the hydraulic system and prime mover. Because all bearings are lubricated by the hydraulic fluid, there are no grease points or oil levels to check. The hydraulic transmission separates and dampens engine and propeller vibrations.

Superior to Diesel Electric

Thrustmaster's hydraulic tunnel thrusters are superior to diesel-electric driven thrusters in terms of response, efficiency and maintainability. Moreover, hydraulic propulsion is more affordable in horsepower applications below 1,000 HP (750 kW).

The units are available in steel or aluminum. They come complete with a section of tunnel, facilitating easy installation.

Thruster design and construction is in accordance with the United States Coast Guard, American Bureau of Shipping, Lloyd's Register and other major classification society rules. Certification to a specific class is available as an option.

Flexible Convenient Installation

Your Thrustmaster hydraulic tunnel thruster can be installed at its most favorable location while the prime mover with hydraulic pump can be installed in the engine room or any other convenient location, optimizing weight distribution and eliminating the requirement for a separate thruster room or additional inspected machinery space. There are no shafts or couplings to align or requirements for additional ventilation, lighting or floor gratings.

You may use a simple AC induction motor or an auxiliary drive off a generator or main propulsion engine. Alternatively, a separate dedicated thruster engine without a clutch or marine reversing gear may be used to drive the hydraulic pump.



Thrustmaster's infinitely proportional thruster controls allow precise and safe maneuvering even in the tightest spaces.



This U.S. Navy Tarpedo Weapons Retriever maneuvers to pick up its explosive cargo with a reliable 307T150 bow thruster.

How to Select Your Tunnel Thruster

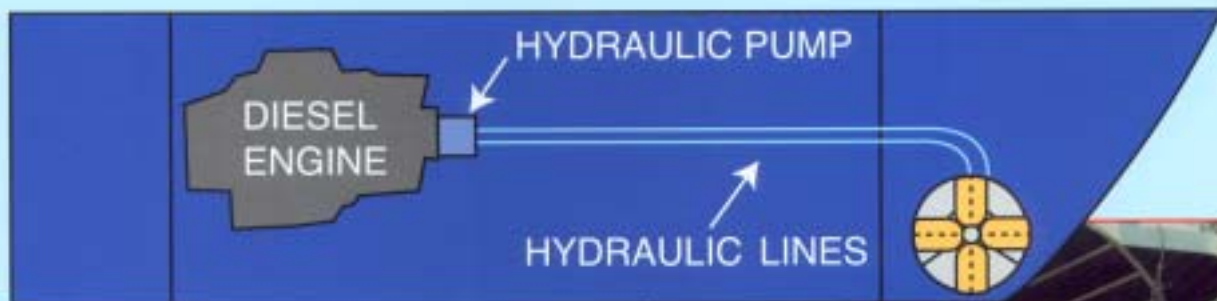
As a rule of thumb, a bow thruster used for docking and undocking should be capable of producing thrust in pounds (lbf) equal to twice the lateral cross sectional vessel area below the water in square feet or two to three times the lateral cross sectional area of the superstructure above the water, whichever is greater.

Sizing of tunnel thrusters for slow speed maneuvering and station keeping depends greatly on the vessel operating parameters. Before making your final selection, consult your naval architect or one of Thrustmaster's application engineers.

Thrustmaster tunnel thrusters can be powered by a single prime mover with a common hydraulic system making the thrusters act in unison as if they were a single thruster.

The tunnel openings in the shell plating increase the resistance of the vessel. In addition to fairing the tunnel entrances for thruster performance improvement, the aft section of the tunnel entrances may be faired back conically to reduce drag.

For high speed applications such as ferries, supply vessels and crewboats, Thrustmaster can provide hydraulically actuated covers which completely close off the tunnel entrances when the thruster is not in use, eliminating tunnel drag.



When using tunnel thrusters in waters with high current or while the vessel has forward speed, the thruster becomes less effective. At vessel speeds of 3 knots, the tunnel thruster may lose as much as 25 percent of its thrust. At speeds of 7 knots, the thruster may only produce half of its rated thrust. A Thrustmaster retractable azimuthing thruster may be more appropriate for these applications.

If space does not allow proper submergence with a single tunnel thruster on a shallow draft vessel, two or more smaller tunnel thrusters, installed side by side, may be used. Multiple



Twin bow thrusters in this shallow draft cruise vessel are powered by a single engine and hydraulic system.



Tremendous windage on this 450 ft. riverboat calls for four 30TT150 tunnel thrusters, a pair in the bow and a pair in the stern. Each pair of thrusters is powered by a single engine.

Noise Suppression

All tunnel thrusters, regardless of drive type, are inherently noisy during operation. Turbulent flow through the tunnel radiates structure-borne noise to decks and bulkheads.

Thrustmaster tunnel thrusters have very low mechanical noise since they do not use right angle gear transmissions. The hydraulic transmission can be designed to operate quietly by generous sizing of fluid conductors, use of resilient piping supports and bulkhead penetrations, and by using intrinsically quiet hydraulic pumps.

Because the tunnel thruster is primarily for intermittent, slow speed maneuvering, noise level is often considered to be less important. Where noise is critical, select the largest practical tunnel diameter for the thrust required. A large tunnel uses a large diameter propeller at slow speed with lower water velocities and less turbulence in the tunnel, resulting in lower noise levels. Install the engine and hydraulic pump in a noise-insulated machinery space.

Hydraulic Systems

Thrustmaster tunnel thrusters can operate in either open or closed-loop hydraulic systems at intermediate to high pressures. A dedicated thruster hydraulic system is not necessarily required. An existing hydraulic system on the vessel may be used to drive the thruster. Alternatively, Thrustmaster can furnish a system that powers a variety of vessel devices in addition to the thruster, including deck cranes, winches, capstans, hydraulic cylinders, etc. Contact your Thrustmaster Representative or our Applications Engineering department in Houston.



This 140 ft. fast Offshore Supply Vessel utilizes an aluminum 24TT100 bow thruster for docking and offloading while holding station near an offshore platform.

Proportional Control Means Quick and Efficient Thrust Response

A drop-in style bridge remote control panel comes with a proportional joystick for infinite thrust control in both port and starboard directions. Prime mover controls and dynamic positioning interface can be included on the thruster panel. Additional bridge wing stations or other controls are also available.



Star Casino, a 260 ft. river Casino vessel, uses a 48TT450 bow thruster. Hydraulic power is provided by the same engine that powers the paddle wheel. Four sister ships use the same system.



Medium to large passenger vessels rely on Thrustmaster tunnel thrusters for safe and efficient maneuvering. This vessel's 24TT100 bow thruster hydraulics are powered by an auxiliary PTO off the main engine.

Technical Data

Tunnel thruster models are listed in the adjacent table. Thrustmaster's model code is easy to understand. The first two digits are the outside diameter of the tunnel in inches. The letters "TT" stand for "Tunnel Thruster." The last digits represent the nominal power rating of the thruster in horsepower.

Outside diameter and minimum tunnel length are listed. Dimensions are in inches. The tunnel can not be shorter without a portion of the thruster housing or the propeller nut extending beyond the tunnel. Longer tunnels can be provided to facilitate easy installation. Alternatively, the shipyard can extend the tunnel by butt welding extensions to either end.

Power values listed in the table represent hydraulic horsepower delivered to the thruster at rated thrust conditions.

Thrust, listed in pounds-force (lbf) is rated static thrust at zero vessel speed. The values are based on short tunnel length with faired inlets, no inlet grating and proper submergence.

Hydraulic flow in USGPM and pressure in PSID are listed for rated thrust output.

Engineering Assistance

Thrustmaster, the world's largest manufacturer of hydraulically-powered marine propulsion equipment, maintains a staff of Application Engineers to assist you with your selection and answer any questions. Thrustmaster Service Engineers provide worldwide service and support for installation, start-up and trials.



The simple installation of Thrustmaster's hydraulic tunnel thrusters make them ideally suited for vessel conversions, even if there is hardly any space left in the bow.



Buoy Tenders, Diving Support Vessels and other specialty vessels require accurate proportional thrust control provided by Thrustmaster hydraulic tunnel thrusters.

Thrustmaster Aluminum Tunnel Thrusters

Model	Tunnel Data		Ratings		Hydraulics	
	Dia.	Length	HP	Thrust	USGPM	PSID
16TT30	16	36	33	600	32	1750
16TT40	16	36	43	800	35	2100
16TT50	16	36	55	1000	38	2500
16TT60	16	36	62	1200	50	2100
16TT70	16	36	74	1400	52	2450
24TT60	24	36	60	1250	47	2200
24TT70	24	36	71	1500	50	2450
24TT80	24	36	80	1700	52	2650
24TT90	24	36	90	1900	62	2500
24TT100	24	36	101	2150	64	2700
24TT110	24	36	112	2350	66	2900
30TT100	30	36	100	2200	69	2500
30TT125	30	36	125	2600	92	2330
30TT150	30	36	150	3000	95	2700
30TT175	30	36	177	3400	119	2550
36TT150	36	36	149	3200	109	2350
36TT175	36	36	174	3750	115	2600
36TT200	36	36	201	4300	138	2500
36TT225	36	36	225	4800	143	2700
36TT250	36	36	254	5250	150	2900

NOTE: Different combinations of hydraulic flow and pressure can be used for many models. Contact your Thrustmaster application engineer with your specific requirements.



This motor tanker uses its 36TT250 bow thruster for the bunkering of larger vessels offshore South Africa. Hydraulic power for the thruster comes from the ship's central hydraulic power system.

Thrustmaster Steel Tunnel Thrusters

Model	Tunnel Data		Ratings		Hydraulics	
	Dia.	Length	HP	Thrust	USGPM	PSID
16TT30	16	36	33	600	32	1750
16TT40	16	36	43	800	35	2100
16TT50	16	36	55	1000	38	2500
16TT60	16	36	62	1200	50	2100
16TT70	16	36	74	1400	52	2450
24TT60	24	36	60	1250	47	2200
24TT70	24	36	71	1500	50	2450
24TT80	24	36	80	1700	52	2650
24TT90	24	36	90	1900	62	2500
24TT100	24	36	101	2150	64	2700
24TT110	24	36	112	2350	66	2900
30TT100	30	36	100	2200	69	2500
30TT125	30	36	125	2600	92	2330
30TT150	30	36	150	3000	95	2700
30TT175	30	36	177	3400	119	2550
36TT150	36	36	149	3200	109	2350
36TT175	36	36	174	3750	115	2600
36TT200	36	36	201	4300	138	2500
36TT225	36	36	225	4800	143	2700
36TT250	36	36	254	5250	150	2900
42TT225	42	48	225	5250	104	3700
42TT250	42	60	252	6000	135	3200
42TT300	42	60	300	7100	143	3600
42TT350	42	60	350	8250	150	4000
48TT350	48	76	354	8300	184	3300
48TT400	48	76	400	9100	178	3850
48TT450	48	76	450	10300	186	4150
48TT500	48	78	503	11500	278	3100
56TT400	56	76	403	9700	175	3950
56TT450	56	78	451	10700	200	3700
56TT500	56	78	501	12000	260	3300
56TT600	56	78	604	14200	276	3750
66TT600	66	86	600	14200	357	2800
66TT700	66	86	700	16600	376	3190
66TT800	66	86	800	19000	394	3480
77TT800	77	86	793	19000	400	3430
77TT900	77	86	900	21400	418	3600
77TT1000	77	86	1000	23700	432	3970

Thrustmaster of Texas, Inc.'s commitment to the marine industry is to provide highly reliable thrusters with superior features at a low total cost of purchase, installation, operation and maintenance.

Other Thrustmaster Products

THRUSTMASTER units are outboard hydraulic propulsion units which range from 75 to 1,000 horsepower. THRUSTMASTERS feature endless steering through 360 degrees, proportional propeller speed control in forward and reverse, hydraulic power tilt and optional propeller depth adjustment. Units are built to order for each specific application.



RETRACTABLE 1000 HP Z-DRIVE



75 HP THRUSTMASTER WITH MINI-SKID



200HP WORKMASTER

WORKMASTERS range from 35 to 1,000 horsepower and have 180 degree steering and proportional propeller speed, forward and reverse, providing omnidirectional thrust capability. WORKMASTERS include hydraulic power tilt and kick-up capabilities and optional propeller depth adjustment. WORKMASTERS are matched to each application from standard components.

Z-DRIVES are thru-hull mounted azimuthing thrusters ranging from 75 to 1,000 horsepower. They provide fully proportional omnidirectional thrust and are available as fixed or as retractable units. Z-DRIVES are tailored for each application.



FIXED 600HP Z-DRIVE

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