Designation: F841 – 19

An American National Standard

Standard Specification for Thrusters, Tunnel, Permanently Installed in Marine Vessels[1]

This standard is issued under the fixed designation F841; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification supplies general characteristics and interface details of propeller type, fixed-tunnel thruster units permanently installed in marine vessels or structures.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

NOTE 1—This specification supplies only general design, interface, and purchase information and does not include requirements for use, thruster controls, or associated equipment. The purchaser of the thruster equipment specified herein is cautioned that he must properly correlate the operating requirements with the thruster specified.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A743/A743M Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application

2.2 *American Bureau of Shipping:*[3]

ABS Rules for Building and Classing Steel Vessels

2.3 *ISO Document:*[4]

ISO 484-2 Shipbuilding — Ship Screw Propellers — Manufacturing Tolerances — Part 2: Propellers of Diameter Between 0,80 and 2,50 m Inclusive

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *continuous duty, n*—operation of the thruster continuously at any power range, up to manufacturer's rating, for extended periods, but not to overlap into recommended maintenance intervals.

3.1.2 *controllable pitch (CP), n*—a propeller in which the blades are attached to a mechanism within the hub by means of bolts or fasteners, so that controlled movement of the mechanism causes the blades to change pitch in unison.

3.1.3 *fixed pitch (FP), n*—a propeller in which the blades are part of, or are rigidly attached to, the hub such that the propeller pitch is constant for a given radius.

3.1.4 *grid bars, n*—bars installed at the tunnel entrances in the form of a mesh to prevent large objects from passing through the thruster tunnel. The area occupied by the grid bars shall not exceed 6 % of the tunnel cross-sectional area.

3.1.5 *intermittent duty, n*—operation of the thruster at peak power or RPM levels, or both, for periods not exceeding 1 h followed by periods of 1 h at the continuous rating or less, with total running time not exceeding 8 h in 24 h.

3.1.6 *landing bars, n*—permanent attachments, usually in the form of plates welded to the tunnel during manufacture, intended to provide joining facilities for deck plates or bulkheads, or both, at installation. Landing bars are neither intended to be part of the support structure for the thruster, nor provide support or transmit forces from the vessel structure to the thruster.

3.1.7 *peak power, n*—highest horsepower developed by the prime mover, or as limited by the thruster manufacturer.

3.1.8 *prime mover, n*—the motor(s) or engine(s) providing the power to drive the thruster.

[1] This specification is under the jurisdiction of ASTM Committee F25 on Ships and Marine Technology and is the direct responsibility of Subcommittee F25.11 on Machinery and Piping Systems.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from American Bureau of Shipping (ABS), ABS Plaza, 1701 City Plaza Drive, Spring TX 77389, http://www.eagle.org.

[4] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

3.1.9 *thruster, n*—a device constructed such as to provide a force or thrust of controlled variable magnitude and direction to a marine vessel or structure, usually, but not limited to, a propeller mounted within a tunnel located below water level.

3.1.10 *tunnel, n*—a part of thruster assembly of circular cross section which houses structure supporting a propeller and drive mechanism.

4. Classification

4.1 Thrusters manufactured in accordance with this specification shall be identified as follows:

4.1.1 *Type I*—Fixed pitch.

4.1.2 *Type II*—Controllable pitch.

4.2 Each type of thruster may be manufactured to the following grade:

4.2.1 *Grade 1*—Intermittent duty for docking and navigation.

4.2.2 *Grade 2*—Continuous duty for stationkeeping or dynamic positioning.

5. Ordering Information

5.1 Requests for quotation and purchase orders shall specify the following (in absence of specific requirements in ordering data, the unit will be provided only as specified herein):

5.1.1 Description of thruster.

5.1.2 ASTM designation and date of issue.

5.1.3 Type.

5.1.4 Grade.

5.1.5 Input Shaft Angle—Refer to Fig. 1.

5.1.6 Tunnel Extensions—Refer to Fig. 2.

5.1.7 Landing bars or other weldments to the thruster to be shown in a sketch or drawing provided by the purchaser.

5.1.8 Type of prime mover.

5.1.9 Input HP and RPM to thruster.

5.1.10 *Material Options for Hub and Blades:*

5.1.10.1 Ni-Al Bronze ABS Type 4.

5.1.10.2 Stainless steel Specification A743/A743M GR CF-3 or CF-8C or other ABS approved material.

5.1.10.3 Manganese bronze ABS Type 2.

5.1.11 Blade hatch.

5.1.12 Instruction books (unless otherwise specified, six copies in English).

5.1.13 Tunnel insert (erosion liner).

5.1.14 Painting or coating, external (water contact surfaces).

5.1.15 Painting or coating, internal (inside hull).

5.1.16 *Dimensional Tolerances and Blade Balancing*—Manufacturer standard practice or ISO 484-2 Accuracy Class II.

5.1.17 Special tools.

5.1.18 Spare parts.

5.2 As a minimum, the following vessel particulars shall be furnished when the thruster manufacturer is required to determine the thruster size; other particulars may be required by the thruster manufacturer.

5.2.1 Vessel type.

5.2.2 Applicable classification society.

5.2.3 Length at waterline.[5]

5.2.4 Width at waterline.[5]

5.2.5 Draft, loaded forward after or draft, ballast forward after.

5.2.6 Dimension of keel to thruster centerline.

5.2.7 Dimension of bow at waterline to thruster centerline.

5.2.8 Beam at the thruster centerline.

5.2.9 Vessel displacement.[5]

5.2.10 Vessel service and operating environment.

5.2.11 Whether grid bars are to be installed.

6. Materials and Manufacture

6.1 *General Requirements*—The tunnel shall be made of tested steel of ABS quality or equal, fabricated, cast or forged, or a combination thereof. All structural welding shall be in accordance with the applicable regulatory agency or the thruster manufacturer's recommendations or both. All welds exposed to (sea) water shall be overlaid with weld metal containing 2½ % nickel, minimum. The minimum tunnel material thickness shall meet applicable classification society requirements. A replaceable insert may be provided in the tunnel in way of the propeller tips to prevent erosion of the tunnel wall (Fig. 3). The minimum width of the insert shall be 10 % of the propeller diameter. If an insert is not used, the tunnel thickness in way of the blades, and for a minimum length of 10 % of the tunnel diameter, shall be increased by at least 10 % of the required thickness. Reinforcement rings/stiffeners may be applied at each end of the tunnel by the manufacturer. The rings may or may not become part of the joint detail to the tunnel extension.

6.2 Propeller blades and hub may be one of the following materials or other material approved by the applicable classification society and shall be specified in the ordering data.

6.2.1 Ni-Al Bronze ABS Type 4.

6.2.2 Stainless Steel Specification A743/A743M GR CF-3 or CF-8C.

6.2.3 Manganese Bronze ABS Type 2.

6.3 All fasteners exposed to (sea) water shall be of monel, stainless-steel, or bronze alloy, unless otherwise specified in the ordering data.

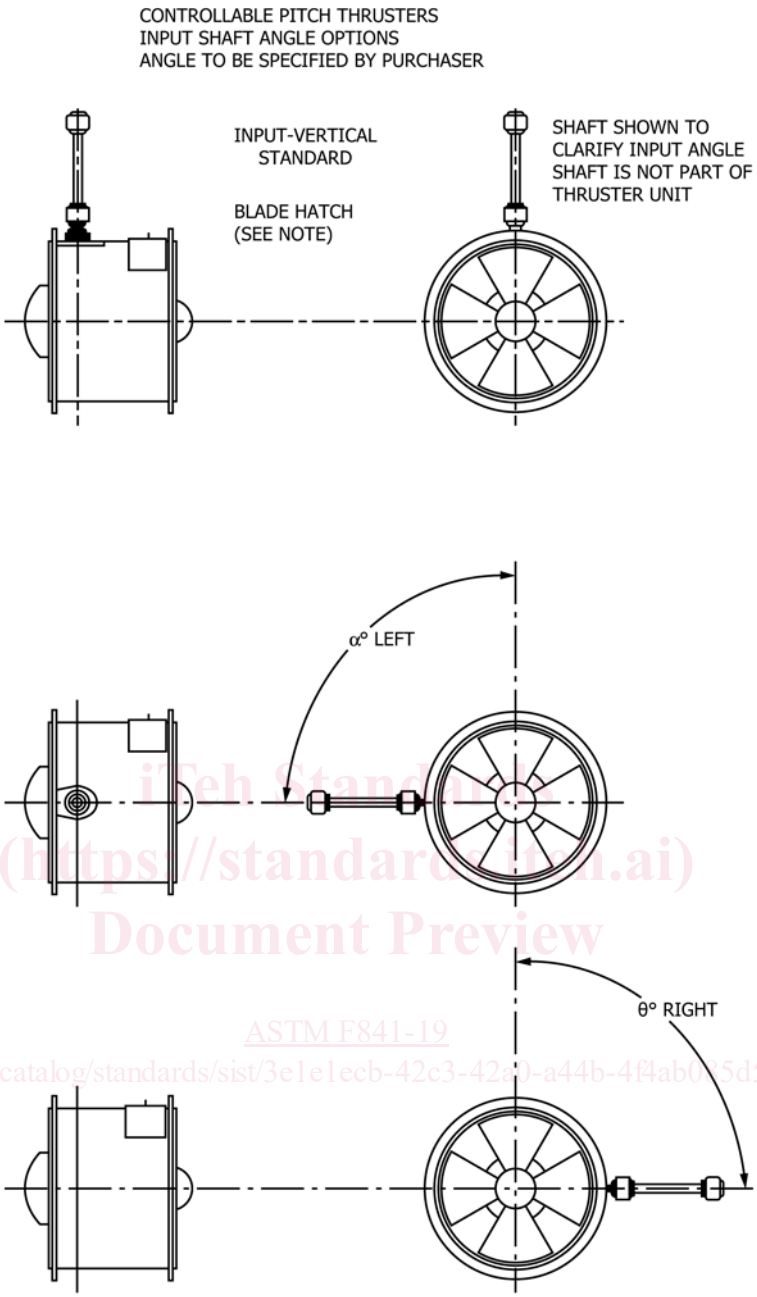
6.4 All materials shall be free of imperfections and defects that adversely affect serviceability.

6.5 All steel surfaces exposed to (sea) water shall be cleaned, painted, or coated in accordance with manufacturer's commercial practice or as otherwise specified in ordering data.

6.6 All steel surfaces that will be within the hull of the vessel shall be cleaned, painted, or coated in accordance with manufacturer's commercial practice or as otherwise specified in ordering data.

6.7 The thruster shall consist of a propeller mounted within a strongly fabricated circular tunnel. The propeller will be secured to a shaft that is rigidly supported in oil lubricated antifriction bearings.

[5] With reference to fully loaded design conditions.



NOTE 1—The thruster will be supplied without the blade hatch unless otherwise specified in the ordering data.

FIG. 1 Input Shaft Angle

6.7.1 A thrust bearing shall be contained within a housing that is securely attached to the tunnel section such as to transmit the thrust developed by the propeller.

6.7.2 A drive mechanism shall be provided to transmit power to the propeller. This also shall be within the housing and be oil lubricated.

6.7.3 The right-angle drive shafting and propeller hub shall be removable, if necessary, for inspection or repair without removing the tunnel from the vessel.

6.7.4 The propeller shall be statistically balanced as specified in the ordering data.

6.7.5 For Type 2 controllable pitch thrusters, the tunnel may be equipped with a removable hatch over the propeller to permit withdrawal of blades. This requirement shall be specified in the ordering data.

6.8 The tunnel shall be attached to the ship's structure by means of tubular extensions that are part of or are welded to the ends of the tunnel. No other welding on the assembled unit is permitted without the manufacturer's approval in view of possible damage to the alignment of drive mechanism and bearings. Should other weldments, for example, landing bars, be required, they shall be specified by the purchaser before the tunnel manufacture.

6.9 A lubrication system shall be provided for bearings and gears. Seals shall be provided to prevent leakage of oil out of