



Standard Specification for Pneumatic Rotary Descaling Machines¹

This standard is issued under the fixed designation F1348/F1348M; 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.

1. Scope

1.1 This specification covers requirements for pneumatic rotary descaling machines for removal of paint, rust, scale, nonskid deck covering, and other coatings from steel and aluminum structures. These portable machines are intended for use in a marine environment, subject to salt air and spray during use and high humidity during storage.

1.2 The values stated in either inch-pound units or SI units are to be regarded separately as standard. The values stated in each system are not exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the specification.

1.3 The following precautionary statement pertains to the test method portion only, Section 12, of this specification: *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.* Specific precautionary statements are given in 17.2.1.

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

[B209 Specification for Aluminum and Aluminum-Alloy Sheet and Plate \(Metric\) B0209_B0209M](#)

[D4417 Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel](#)

¹ This specification is under the jurisdiction of ASTM Committee F25 on Ships and Marine Technology and is the direct responsibility of Subcommittee F25.07 on General Requirements.

Current edition approved May 1, 2023. Published June 2023. Originally approved in 1991. Last previous edition approved in 2019 as F1348/F1348M – 91 (2019). DOI: 10.1520/F1348_F1348M-91R23.

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.

[F1166 Practice for Human Engineering Design for Marine Systems, Equipment, and Facilities](#)

2.2 Federal Specifications:³

[Fed. Std. No. 123 Marking for Shipment \(Civil Agencies\)](#)

[PPP-B-566 Boxes, Folding, Paperboard](#)

[PPP-B-601 Boxes, Wood, Cleated-Plywood](#)

[PPP-B-621 Boxes, Wood, Nailed and Lock-Corner](#)

[PPP-B-636 Boxes, Shipping, Fiberboard](#)

[PPP-B-640 Boxes, Fiberboard, Corrugated, Triple Wall](#)

[PPP-B-676 Boxes, Setup](#)

2.3 Military Specifications:⁴

[MIL-STD-129 Marking for Shipment and Storage](#)

[MIL-STD-147 Palletized Unit Loads](#)

[MIL-B-117 Bags, Sleeves and Tubing](#)

[MIL-H-775 Hose, Hose Assemblies; Rubber, Plastic, Fabric or Metal \(Including Tubing\); and Associated Hardware: Packaging of](#)

[MIL-L-17331 Lubricating Oil, Steam Turbine, Noncorrosive](#)

[DOD-G-24508 Grease, High Performance, Ball Roller Bearing, Continuous Run to 300°F](#)

2.4 ABS Publication:⁵

[ABS Rules for Building and Classing Steel Vessels](#)

3. Classification

3.1 Descaling machines are available in two types and two classes, as follows:

3.1.1 Type 1, Hand-Held:

3.1.1.1 Class A—Inch-pound design, and

3.1.1.2 Class B—SI metric design.

3.1.2 Type 2, Deck-Supported:

3.1.2.1 Class A—Inch-pound design, and

3.1.2.2 Class B—SI metric design.

3.2 Hubs for use with descaling machines are available in four classes, as follows:

3.2.1 Class A—Nonmetallic, nonwoven, noncontaminating,

3.2.2 Class B—Peening hub for aluminum surfaces,

³ Available from U.S. Government Printing Office, Superintendent of Documents, 732 N. Capitol St., NW, Washington, DC 20401-0001, <http://www.access.gpo.gov>.

⁴ Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, <http://quicksearch.dla.mil>.

⁵ Available from American Bureau of Shipping (ABS), ABS Plaza, 16855 Northchase Dr., Houston, TX 77060, <http://www.eagle.org>.

3.2.3 *Class C*—Metallic hammer type for steel surfaces, and

3.2.4 *Class D*—Metallic cutter type for steel surfaces.

4. Ordering Information

4.1 Orders for material under this specification shall include the following:

4.1.1 Title, number, and date of this specification,

4.1.2 Quantity,

4.1.3 Type and class required (see Section 3),

4.1.4 Test and inspection certification requirements, if applicable (see Section 15),

4.1.5 Test report requirements (see Section 15),

4.1.6 Technical manual requirements (see Section 16),

4.1.7 Special marking required (see 18.3),

4.1.8 Level of preservation, packaging, packing, and marking required (see Section 17 and Supplementary Requirements), and

4.1.9 Lubrication requirements of Supplementary Requirements, if applicable (see Section S3).

5. Materials and Manufacture

5.1 *Asbestos and Cadmium*:

5.1.1 Material used in the machines, or in any components, accessories, repair parts, tools, and packing and packaging shall be free of asbestos and cadmium.

5.2 *Metal Parts*—Metal parts shall be corrosion resistant or treated to resist corrosion.

6. Mechanical Properties

6.1 The machines shall be powered by an air motor and shall accept each of the rotary hubs (see 6.9).

6.1.1 *Type 1*—The Type 1 machine shall be a hand-held unit having a minimum of two handles, one of which shall house the trigger mechanism. The trigger mechanism shall be of the spring-loaded “dead man” type and shall immediately shut off air flow to the motor when released. The arrangement of the handles and trigger mechanism shall permit right- or left-handed operation with equal ease. The direction of rotation of the hubs shall tend to propel the machine in the forward direction, away from the operator. The Type 1 machine shall remove coatings to within ¼ in. [6 mm] of bulkheads, coamings, decks, and other immovable objects.

6.1.2 *Type 2*—The Type 2 machine shall be a deck supported unit with a T-shaped operating handle. The operating handle shall be adjustable for height, rigid and strong enough to operate the machine without bending, and long enough to allow any operator with the percentile body dimensions specified herein (see 6.2) to operate the machine while walking behind it in a natural walking position. The air hose connection and trigger mechanism shall be located on the T-handle. The trigger mechanism shall be of the spring-loaded “dead man” type and shall immediately shut off air flow to the motor when released. The handle shall detach or be adjustable to and lockable in the vertical position for storage. The machine shall be provided with at least two wheels used to move the machine. With the handle, air hose and each of the abrasive hubs attached, the machine shall sit level on the deck with the abrasive hubs in contact with the deck and not interfere with

TABLE 1 Maximum Dimensions and Weights

	Type 1 Class A	Type 1 Class B	Type 2 Class A	Type 2 Class B
Length	16 in.	410 mm	36 in.	915 mm
Width	6 in.	155 mm	16 in.	410 mm
Height	12 in.	306 mm	48 in.	1220 mm
Weight	5 lb	2.3 kg	110 lb	50 kg

deck coating removal process. The machine shall easily propel itself or be propelled by the operator across the deck without overstressing the operator (see 6.2). The Type 2 machine shall remove deck coating to within 1½ in. [40 mm] of the bulkheads, coamings, and other immovable objects.

6.2 *Human Engineering*—The machines shall be in accordance with the human engineering criteria of Practice F1166 except where such requirements conflict with the requirements of this specification. The machines shall incorporate the maintainability requirements of Practice F1166 and shall permit safe and efficient performance of operation and maintenance by the fifth percentile female to the ninety-fifth percentile male, as defined in Practice F1166. Clearance shall be provided around each component, part or control so that an individual with aforementioned percentile body dimensions and physical capabilities can safely operate, maintain, remove, or replace any item using normally available tools and test equipment. The controls required for operation and maintenance shall be in accordance with Practice F1166 and shall not require operator forces to exceed the strength limitations listed therein.

6.3 *Interchangeability*—Component parts and assemblies peculiar to each type and class of machine from any one manufacturer shall be fully interchangeable. Such interchangeability shall not require any alterations or modifications.

6.4 *Dimensions and Weight*—The machines, fully assembled with guards; debris collector attachment (less hoses and collection container); and with operating handles (Type 2) locked in its operating position; fully lubricated and ready in all aspects for operation (less air hose and filter, evaporator and lubricator attachments) shall not exceed the maximum dimensions and weight shown in Table 1.

6.5 *Air Motor*—The machines shall be driven by air motors that operate on the minimum air supplies as shown in Table 2.

6.6 *Guards*—Machines of both Type 1 and Type 2 shall be provided with guards that protect the operator from inadvertent contact with moving parts and prevent uncontrolled scattering of chips or scale removed by the machine. These guards shall not interfere with the performance of the machine throughout the machine’s useful life, unduly decrease any of the hub’s physical dimensions or wear, or interfere with changing of the hubs. The guards/rotary hub containment shall be constructed to accommodate a debris collection system.

6.7 *Air Connections*—Air connections for both Type 1 and Type 2 machines shall be of the quick disconnect type. The locations of the air connection shall be such that the hose does not interfere with operation of the machine or the operator. The inside diameter of the connections shall be in accordance with Table 3.

TABLE 2 Air Supplies

	Type 1 Class A	Type 1 Class B	Type 2 Class A	Type 2 Class B
Air pressure	80 lb/in. ²	550 kPa	80 lb/in. ²	550 kPa
Air volume	18 ft ³ /min	0.51 m ³ /min	125 ft ³ /min	3.54 m ³ /min

TABLE 3 Air Connections

Type 1 Class A	Type 1 Class B	Type 2 Class A	Type 2 Class B
¼ in.	6.3 mm	½ in.	12.7 mm

6.8 *Lubrication*—Lubrication fittings shall be installed so that lubrication can be accomplished without disassembly of the machine (see 6.2). Lubrication materials shall be high-temperature lubricating oil or high-performance grease.

6.9 Hubs:

6.9.1 Hubs for each type and class of machine shall clean a path of width not less than that shown in Table 4. Hubs for each type, class, and manufacture of machine shall be interchangeable with hubs of any other machine of the same type, class, and manufacture, using only the normally available tools (see 8.1.2) for the interchange.

6.9.2 Hubs shall be of the following classes, classified by intended composition, function, and service life, as follows:

6.9.2.1 *Class A Hub*—The Class A hub shall be nonmetallic, nonwoven, noncontaminating, and shall remove paint, rust, or scale. The Class A hub shall feather the edge of a painted surface in a smooth taper from the painted aluminum surface to bare metal, and shall not remove, erode, or groove metal surfaces. The Class A hub shall have a minimum service life of 8 h.

6.9.2.2 *Class B Hub*—The Class B hub shall remove paint, rust, or scale and shallpeen the aluminum surface to a profile of 1.0 mils to 3.0 mils [0.0025 mm to 0.0076 mm]. The Class B hub shall have a minimum service life of 50 h.

6.9.2.3 *Class C Hub*—The Class C hub shall be a metallic hammer type assembly and shall remove paint and nonskid covering on steel surfaces. The Class C hub shall operate over protrusions or obstructions on the deck surface, such as bolts or padeyes, up to a height of 1 in. [25 mm], without damage to the hub or machine. The Class C hub shall have a minimum service life of 100 h.

6.9.2.4 *Class D Hub*—The Class D hub shall be a metallic type cutter assembly that removes paint, rust, scale, and nonskid deck coverings on steel surfaces. The Class D hub shall have a minimum service life of 30 h.

7. Performance Requirements

7.1 *Removal Rate*—The minimum removal rate when tested in accordance with Section 12 shall be as specified in Table 5 and Table 6.

7.1.1 *Type 1 Machine*—See Table 5.

7.1.2 *Type 2 Machine*—See Table 6.

TABLE 4 Minimum Path Width

Hub for:	Minimum Path Width
Type 1 Class A machine	2 in.
Type 1 Class B machine	50 mm
Type 2 Class A machine	5 in.
Type 2 Class B machine	125 mm

TABLE 5 Removal Rate; ft²/h (m²/h)

Hub Class	Paint		Rust/Scale		Nonskid	
	Class A Machine	Class B Machine	Class A Machine	Class B Machine	Class A Machine	Class B Machine
A	50	4.5	25	2.3	...	...
B	65	6.0	35	3.3	...	...
C	85	8.0	...	...	20	1.9
D	85	8.0	25	2.3	25	2.3

TABLE 6 Removal Rate; ft²/h (m²/h)

Hub Class	Paint		Rust/Scale		Nonskid	
	Class A Machine	Class B Machine	Class A Machine	Class B Machine	Class A Machine	Class B Machine
A	200	18.5	150	13.9	...	...
B	300	27.9	200	18.5	...	...
C	350	32.5	...	...	80	7.4
D	350	32.5	200	18.5	100	9.3

7.2 Stability:

7.2.1 *Type 1 Machine*—The assembled Type 1 machine shall operate at any angle from the horizontal to vertical (including the overhead) without loss of power or descaling efficiency.

7.2.2 *Type 2 Machine*—The assembled Type 2 machine shall operate without loss of power and descaling efficiency and without tipping when inclined at an angle of 15° from the horizontal in any direction.

8. Attachments

8.1 The machine shall be furnished in kit form, with each kit containing the following items besides the basic machine:

- 8.1.1 One Class A hub,
- 8.1.2 One Class B hub,
- 8.1.3 One Class C hub,
- 8.1.4 One Class D hub,
- 8.1.5 One air hose with fittings,
- 8.1.6 One hub-changing tool (or tool set),
- 8.1.7 One debris collector,
- 8.1.8 One carrying case, and
- 8.1.9 One in-line filter/evaporator/lubricator.

8.1.10 *Air Hose*—Air hoses shall be ⅜ in. [10 mm] for Type 1 machine and ¾ in. [19 mm] for Type 2 machine with quick-disconnect connections and an air shutoff valve that shall immediately shut off the air when the hose is disconnected. The hose for the Type 1 machine shall be 50 ft [15 m] long and the hose for the Type 2 machine shall be 100 ft [30 m] long.

8.1.11 *Hub Changing Tool*—A standard commercially available tool for changing hubs shall be provided. The tools shall not be unique to a specific supplier.

8.1.12 *Carrying Case*—The carrying cases for Type 1 and Type 2 machines shall be corrosion-resistant, fire-resistant, high-impact material, strong and rigid enough to transport the

machine and its accessories. The carrying case shall rigidly hold all accessories with the exception of hoses, without deformation or breakage, and shall be less than 24 in. [610 mm] wide. The carrying case shall also hold the machine's handle when the handle is disconnected.

8.1.13 *Debris Collector*—Both Type 1 and Type 2 machines shall be capable of attaching a debris collecting device that will collect a minimum of 95 % of the debris created.

8.1.14 *In-Line Filter/Evaporator/Lubricator*—A filter to remove air system debris, an evaporator to remove moisture, and a lubricator to continually lubricate the machine or a combination unit shall be installed to ensure satisfactory long-term use in a marine environment. These units shall not hinder the operator's ability to handle and use the machine.

9. Number of Tests

9.1 A first unit shall satisfactorily pass the tests in Section 12 before production units are offered for delivery.

10. Specimen Preparation

10.1 *Test Plates*—Steel test plates shall be in accordance with the American Bureau of Shipping (ABS) Rules for Building and Classing Steel Vessels. Aluminum test plates shall be in accordance with Specification B209, Alloy 5086. Test plates shall be at least ¼ in. [6 mm] thick. Area of plates used in performance tests shall be at least equal to the area that would be cleaned in 10 min at the minimum hourly removal rate for the machine and hub being tested.

10.2 Test Surface Preparation:

10.2.1 Test plates shall be prepared for the performance tests as specified herein. Coatings shall be prepared for application in accordance with manufacturer's instructions.

10.2.1.1 *Painted Surfaces*—The steel or aluminum surface shall be cleaned to a uniform white appearance with a minimum surface profile of 1.0 mils to 3.0 mils [0.025 mm to 0.075 mm]. The surface shall be dry and free of all contaminants. Two coats of an epoxy-polyamide primer followed by two coats of epoxy paint shall be applied, each coat approximately 3 mils [0.075 mm] thick. Minimum time between coats and between application of last coat and commencement of test shall be 24 h each.

10.2.1.2 *Rusted Steel Surfaces*—The steel surface shall be wet and exposed to air until it exhibits a complete, uniform coating of rust. A saline solution may be applied to speed rusting. The rusted surface shall be allowed to air dry before testing.

10.2.1.3 *Surface with Nonskid Coating*—The surface shall be cleaned to a uniform white appearance with a minimum surface profile of 1.0 mils to 3.0 mils [0.025 mm to 0.075 mm]. The surface shall be dry and free of all contaminants. One coat of an epoxy-polyamide primer approximately 3 mils [0.075 mm] thick and one coat of a nonskid coating compound shall be evenly applied. The nonskid compound shall be a two part synthetic resin compound, consisting of the basic resin plus aggregate and hardener. The nonskid after curing shall have a minimum average thickness of 30 mils [0.75 mm]. Minimum time between coats and between application and drying/curing of last coat and commencement of test shall be 24 h.

TABLE 7 Required Performance Tests

Surface	Class A Hub	Class B Hub	Class C Hub	Class D Hub
Painted steel	X	X	X	X
Painted aluminum	X	X	...	...
Rusted steel	X	X	X	X
Steel with nonskid	...	...	X	X

11. Responsibility for Tests and Inspections

11.1 Unless otherwise specified in the contract or purchase order, the manufacturer is responsible for the performance of all inspection and test requirements specified in this specification. Except as otherwise specified in the contract or purchase order, the manufacturer may use his own or any other suitable facilities for the performance of the inspection and test requirements unless disapproved by the purchaser at the time the order is placed. The purchaser shall have the right to perform any of the inspections and tests set forth in this specification when such inspections and tests are deemed necessary to ensure that the material conforms to prescribed requirements. Each party has the right to witness tests performed by the other party.

12. Test Methods

12.1 *Service Life Test*—Conduct service life tests on an uncoated steel test plate (see 11.1). Operate the machine and each hub in full contact with the test plate for the minimum service life specified herein for the particular hub being tested. The test may be continuous or may consist of shorter time periods adding up to the applicable service life. Breaks between the shorter test periods are limited to 1 h followed by 1 h or more of operation (simulation of daily usage). Fracture, bending, or other failures affecting usability of any component of the machine or hub constitutes a defect. The service life test precedes the performance tests for each hub.

12.2 Performance Tests:

12.2.1 Test each hub on the test surfaces required in Table 7. Use the machine for 10 min. Measure the area of the surface that is cleaned to bare metal in 10 min and multiply by six to determine the hourly removal rate. Failure to attain an hourly removal rate at least equal to the minimum removal rate stated in Section 7 constitutes a defect.

12.2.1.1 *Class A Hub*—After each performance test with the Class A hub, examine the metal surface for scoring, gouging, or erosion of metal. Presence of any of these conditions constitutes a defect.

12.2.1.2 *Class B Hub*—After each performance test with the Class B hub, test the metal surface in accordance with Test Methods D4417 to determine its surface profile. Failure to produce a surface profile between 1.0 mils to 3.0 mils [0.0025 mm to 0.0076 mm] constitutes a defect.

12.3 *Stability*—Test the Type 1 machine on horizontal (including the overhead) and vertical surfaces at no load and full load. Conduct stability operation test on the Type 2 machine inclined at an angle of 15° in any direction from the normal horizontal position and at both no load and full load. For the Type 2 machine, loss of power or tipping constitutes a defect.