MIL-D-80251A
19 January 1984
SUPERSEDING
MIL-D-80251
4 March 1977

MILITARY SPECIFICATION

# DIMPLING MACHINES, HOT AND COLD PROCESS, SQUEEZE TYPE, FLOOR MOUNTED

This specification is approved for use by all Department and agencies of the Department of Defense.

## 1. SCOPE

1.1 Scope. This specification covers floor mounted, squeeze type dimpling machines. These machines are used to form shallow, conical depressions around rivets or screws, allowing the fastener heads to fit flush with the surface of the sheet metal.

## 2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards and handbooks. Unless otherwise specified, the following specifications, standards and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation, form a part of this specification to the extent specified herein.

Beneficial comments (recommendations, addition, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Defense Industrial Plant Equipment Center, Memphis, TN 38114, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 3448

SPECIFICATIONS

MILITARY

MIL-M-18058 - Machinery, Metal and Woodworking, Packaging of

STANDARDS

FEDERAL

FED-STD-H28 - Screw Thread Standards for Federal Services

MILITARY

MS-20426 - Rivet, Solid, Countersunk 100 Deg., Precision Aluminum and Aluminum Alloy
MS-24694 - Screw, Machine, Flat Countersunk Head, 100 Deg., Structure, Cross Recessed, UNC-3A and UNF-3A

2.1.2 Other Government documents, drawings and publications. The following other Government documents, drawings, and publications form a part of this specification to the extent specified herein.

U. S. DEPARTMENT OF LABOR

OSHA 2206 - General Industry, OSHA Safety and Health Standards (29 CFR 1910)

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Officer, Washington, DC 20402.

(Copies of specifications, standards, handbooks, drawings, and publications required by manufacturers in connection with specified acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Other publications. The following document(s) form a part of this specification to the extent specified herein. The issue of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ICS - Industrial Controls and Systems

(Application for copies should be addressed to the National Electrical Manufacturers Association, 2101 L Street, NW, Washington, DC 20037.)

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI/IEEE-268 - Metric Practice

(Application for copies should be addressed to the American National Standards Institute, ATTN: Sales Dept., 1430 Broadway, New York, NY 10018).

AMERICAN SOCIETY FOR TESTING AND MATERIALS

ASTM-D-3951 - Commercial Packaging, Standard Practice For

(Application for copies should be addressed to the American Society for Testing Materials, 1916 Race Street, Philadelphia, PA 19103.)

2.3 Order of precedence. In the event of conflict between the text of this specification and the references cited herein, the text of the specification shall take precedence.

3. REOUIREMENTS

3.1 First article. When specified (see 6.2.1), a sample shall be subjected to first article inspection (see 4.2 and 6.3).

3.2 Design. The machine shall be new and one of the manufacturer's current models capable of forming dimples in accordance with the requirements herein. The machine shall include all features necessary to meet the performance requirements specified herein. All parts subject to wear, breakage or distortion shall be accessible for adjustment, replacement and repair.

3.2.1 Materials. All materials used in fabricating the machine shall be compatible with and non-reactive to titanium and titanium alloys (see 6.5).

3.2.2 Reclaimed materials. The machine may contain reclaimed materials provided such materials will not jeopardize the machine's intended use and performance. The reclaimed materials shall have been reprocessed, remanufactured or recycled in a manner which will restore them to the same chemical composition and physical properties as the materials originally selected for use on the machine.

3.2.3 Safety and health requirements. Covers, guards, or other safety devices shall be provided for all parts of the machine that present safety hazards. The safety devices shall not interfere with operation of the machine. The safety devices shall prevent unintentional contact with the guarded part, and shall be removable to facilitate inspection, maintenance and repair. All machine parts, components, mechanisms, and assemblies furnished on the machine, whether or not specifically required herein, shall comply with all of the requirements of OSHA 2206 that are applicable to the machine itself. Additional safety and health requirements shall be as specified (see 6.2.1 and 6.4).

3.2.4 Lubrication. Means shall be provided to insure adequate lubrication for all moving parts. Each recirculating system shall include a filter which is cleanable or replaceable. Each lubricant reservoir shall have means for determining fluid level. All oil holes, grease fittings, and filler caps shall be accessible.

3.2.5 Measurement systems. Unless otherwise specified, either the U. S. Customary System of Units (US) or the International System of Units, (SI) may be used in the design and construction of the machine when only one system of measurement is acceptable, the particular system required shall be as specified (see 6.2.1.) In this specification, all measurements, dimensions, sizes and capacities are given in the U.S. Customary System of Units (US). These measurements may be converted to the International System of Units (SI) through the use of the conversion factors and methods specified in ANSI/IEEE268.

3.3 Construction. The machine shall be constructed of parts which are new, without defects and free of repairs. The structure shall be capable of withstanding all forces encountered during operation of the machine to its maximum rating and capacity without permanent distortion.

3.3.1 Castings and forgings. All castings and forgings shall be free of scale and mismatching. No process such as peening, plugging, or filling with solder or paste shall be used for reclaiming any defective parts.

3.3.2 Welding, brazing, or soldering. Welding, brazing, or soldering shall be employed only where specified in the original design. None of these operations shall be employed as a repair measure for any defective part.

3.3.3 Fastening devices. All screws, pins, bolts and other fasteners shall be installed in a manner that prevents change of tightness. Those subject to removal or adjustment shall not be swaged, peened, staked or otherwise permanently installed.

3.3.4 Surfaces. All surfaces shall be cleaned and free of sand, dirt, fins, sprues, flash, scale, flux and other harmful or extraneous materials. All edges shall be either rounded or beveled unless sharpness is required to perform a necessary function. Except as otherwise specified herein, the condition and finish of all surfaces shall be in accordance with the manufacturer's commercial practice.

3.3.5 Painting. Unless otherwise specified (see 6.2.1), the machine shall be painted in accordance with the manufacture's commercial practice.

3.3.6 Threads. All threaded parts used on the machine and its related attachments and accessories shall conform to FED-STD-H28 and the applicable "Detailed Standard" section reference herein.

3.3.7 Plates. All words on instruction and indicating plates shall be in the English language. Characters shall be engraved, etched, embossed or stamped in boldface on a contrasting background, and the plate shall be securely affixed to the machine.

3.4 Components. The dimpling machine shall consist essentially of a frame, die holders, dimpling dies, die heaters, a pneumatic or hydraulic system, electrical system, their related control systems, and any additional components required to enable the dimpling machine to meet all requirements stated herein.

3.4.1 Frame. The frame shall be of the pedestal mounted "C-frame" type. The frame shall have die holders that securely hold the dies and maintain die alignment while dimpling metal of the thicknesses specified in Table II. The throat depth of all machines covered herein shall be not less than 36 inches. The throat height of all machines shall be capable of accommodating metals of the thicknesses specified in table II. Means shall be provided for securely attaching the machine to the floor.

3.4.2 Die holders. The frame shall have die holders that allow the dies to be easily changed, and also hold the dies in alignment during the dimpling process. The holders shall accommodate all dies required for forming dimples for all the types and sizes of fasteners specified in Table II. The holders shall have all necessary adjustments for adjusting the dies for all metal thicknesses specified in table II. The die holders shall also have means for adjusting die alignment. If special aligning tools, or gauges, are required for adjusting die alignment, the aligning tools and gauges shall be furnished with the machine.

3.4.3 Die sets. Unless otherwise specified (see 6.2.1), each machine shall have one set of punches and dies for each fastener type and size shown in Table II. All die sets shall be made of carbide or machined from a wear resistant alloy steel that is heat treated to impart the necessary die hardness and toughness, and when specified (see 6.2.1) the dies shall be hard chrome plated. Unless otherwise specified the machine shall have die sets that are either of the one-piece punch and one-piece die type, or of the ram-coin type having a one-piece punch and a two-piece coining ram type die. When specified (see 6.2.1), the machine shall be designed to utilize and shall be furnished with the ram-coin type die sets. This type of die set shall have a pressure pad in the die assembly, operated by the machine's pneumatic or hydraulic control system that clamps the workpiece between the male and female die members while the dimple is being formed. The machine shall have means of controlling the clamping force. The members shall be capable of withstanding the full force applied by the machine without chipping, cracking, or sustaining other damage while dimpling material of maximum thickness as shown in Table II.

3.4.4 Die heating system. The machine shall have electric heating elements that surround or contact both dies and maintain them at a preselected temperature. The heat contained in the dies shall be transferred, by conduction, to the workpiece during the "dwell" phase of the dimpling cycle. The die heaters shall have sufficient wattage to meet all of the following requirements when operating at an ambient temperature of 65° to 80°F. Starting with the dies at ambient temperature, the heaters shall be capable of raising the temperature of both dies at an average temperature rise of not less than 150° per minute. When forming dimples for 1/4 inch rivets in alloy 7075-T6 aluminum sheet having a thickness of 0.102 inch, the heater wattage shall be adequate to allow the machine to form not less than 8 dimples, per minute and maintain a die temperature of 650° ±25°F.

3.4.5 Electrical system. Unless otherwise specified (see 6.2.1), the electrical system shall conform to all requirements of this paragraph. All electrical equipment shall conform to the requirements of NEMA ICS. The machine shall draw all of its electrical power from a single set of input leads fed through a safety disconnect switch or circuit breaker. The machine's electrical system shall include all devices, such as transformers or rectifiers, that are necessary to operate all electrical components from a single set of input leads. The machine shall operate from a 115 volt, single phase, 60 Hz power source.

3.4.5.1 Cycle control system. The machine covered herein shall have a cycle control system consisting of devices such as timers, stepping switches, relays or other forms of similar controls, that automatically cause the various events of the dimpling cycle to occur in the proper sequence and for the proper time period. After adjustment of all preselectable electrical, pneumatic and hydraulic controls and after operation of a foot switch, the cycle control system shall perform all operations necessary to form the dimple, without requiring any operator attention other than holding the workpiece in proper position.

3.4.5.2 Die heater control system. The machine covered herein shall have a die heater control system meeting the following requirements. A selector switch shall be provided to permit dimpling at room temperature or with both die heaters in operation. Each die heater shall have an individual temperature control device having a dial graduated in "Degrees F" that allows the die temperature to be manually preselected and automatically controlled for two preset temperatures over a range of 250°F, or less, to 800°F, or more. The devices shall maintain the preselected die temperatures to an accuracy of ±25°F throughout the stated temperature range, under all operating conditions. The system shall have devices that provide a visual indication of whether or not each die heater is at its preselected temperature. The devices may either be signal lights or thermo couple pyrometer devices that continually provide a visual indication of the actual temperature of the dies. To prevent the formation of damaged or incorrectly formed dimples due to the low temperature, the system shall have a manually adjustable control that will stop the dimple cycle if the die temperature fall below the preselected value.

3.4.5.3 Timers. All machines covered herein shall have a timer that regulates the time period during which the dies clamp the workpiece.

3.4.5.4 Portable die heater control system. When specified (see 6.2.1), a solid state portable temperature control unit designed to regulate and automatically control dimpling die temperatures, pressure, dwell time, and final forming pressure for the machine shall be provided.

3.4.6 Die closing mechanism. All measures covered herein shall have one, or more, hydraulic or pneumatic power cylinders that operate the linkage that actuates the dies. During the first phase of the die closing cycle, the mechanism shall close the dies at a preselected speed that allows the operator to position the workpiece so that the punch properly

enters the pilot hole without damaging the surrounding area. The mechanism shall then exert a preselected higher force that firmly clamps the heated dies to the workpiece allowing die heat to flow to the workpiece. The die closing mechanism shall then exert full force on the dies to complete the formation of the dimple. The variable forces exerted on the dies shall either be accomplished by use of two or more power cylinders, or by varying the hydraulic or pneumatic pressure, or by any combination of these methods. When specified (see 6.2.1), the machine shall have a mechanism that prevents the dies from closing unless the die punch pilot has entered the pilot hole in the workpiece. The mechanism shall be adjustable so that the punch pilot makes no marks, or makes a barely perceptible mark on the workpiece.

3.4.7 Pneumatic system. If the machine is pneumatically operated, it shall operate on the machine purchaser's shop air supply having a line pressure of 90 to 120 psi. The machine shall have an air line filter, water trap, and oil mist lubricator. The system shall include all devices such as pressure regulators, pressure reducers, solenoid valves, and check valves that are necessary to enable the machine to meet all requirements stated herein. Air pressure gauges shall be provided to indicate input air pressure and to allow observation of air pressure in all lines that are downstream from a pressure control device.

3.4.8 Hydraulic system. If the machine is hydraulically operated, the hydraulic system shall be a complete self-contained system including all pumps, fluid reservoir, valves, piping, hoses, cylinders, pressure regulators and control. A high pressure relief valve shall be installed in high pressure lines for components protection. A filter system shall be provided to insure delivery of clean fluid. The hydraulic reservoir shall have means for determining fluid level.

3.5 Sizes and capacities. The dimpling machine covered herein shall meet the requirements of Table I and shall be capable of forming dimples for all fastener types and sizes, and in the metal thickness ranges as shown in Table II.

TABLE I. Sizes and Capacities.

| | |
|---|---|
| MAXIMUM OUTPUT FORCE (with 90 lbs. Input Air Pressure) | (Not less than) 20,000 lbs. |
| THROAT DEPTH or REACH (From center line of plunger to extreme inside face of gap or yoke) | (Not less than) 36 inches |
| YOKE | |
| (1) Vertical inside clearance of gap of yoke | (Not less than) 8 inches |
| (2) Distance between upper set holding plunger and lower set holder minus the die sets | |
| (a) Upper set holding plunger energized and lower set holder adjusted to UP position | (Not more than ) 1-3/4 inches |
| (b) Upper set holding plunger energized and lower set holder adjusted to extreme DOWN position | (Not less than) 2-3/4 inches |

TABLE II

FASTENER AND MATERIAL RANGES
METAL THICKNESS RANGE, Inch

| Fastener Types and Sizes | Aluminum Alloys | | Magnesium Alloys | | Corros. Annealed | | Resist Steel 1/2 Hard | | Titanium Comm. Pure and Ti-8Mn | | Titanium Alloys Ti641-4V Ti-AAl-3mO-IV Ti-8Al-1MO-IV Ti-5Al-2-55N | | Stainless Steel Precipitation Hardening Types Hardening Types: 15-7PH 17-7PH | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| MS-20426 Rivet | | | | | | | | | | | | | | |
| 3/32 | 020 | .051 | .015 | .040 | .016 | .040 | .016 | .040 | .020 | .040 | .020 | .040 | .032 | .040 |
| 1/8 | 020 | .063 | .020 | .051 | .016 | .051 | .016 | .051 | .020 | .080 | .020 | .051 | .032 | .040 |
| 5/32 | 025 | .072 | .020 | .072 | .016 | .063 | .016 | .051 | .020 | .080 | .020 | .063 | .032 | .040 |
| 3/16 | 025 | .080 | .020 | .080 | .016 | .072 | .016 | .063 | .020 | .091 | .020 | .063 | .032 | .040 |
| 1/4 | 032 | .102 | .025 | .102 | .025 | .063 | .025 | .051 | .025 | .063 | .020 | .063 | .032 | .040 |
| MS-24694 Screw | | | | | | | | | | | | | | |
| #8 | 020 | .072 | .020 | .072 | .016 | .072 | .016 | .040 | .016 | .063 | .020 | .051 | .032 | .040 |
| #10 | 020 | .091 | .020 | .091 | .020 | .080 | .020 | .051 | .016 | .063 | .020 | .063 | .032 | .040 |
| #4 | 032 | .102 | .025 | .102 | .020 | .051 | .020 | .051 | .032 | .063 | .020 | .063 | .032 | .040 |
| 5/16 | | | | | | | | | | | | | | |
| HI-Shear Rivet | | | | | | | | | | | | | | |
| 3/16 | 020 | .063 | .020 | .063 | .016 | .063 | .016 | .063 | .020 | .080 | .025 | .063 | | |
| 1/4 | 025 | .072 | .025 | .072 | .025 | .063 | .025 | .063 | .020 | .063 | .025 | .063 | | |
| 5/16 | 032 | .080 | .025 | .080 | .023 | .051 | .032 | .051 | .025 | .063 | .032 | .051 | | |
| Camloc Fasteners | | | | | | | | | | | | | | |
| CLC-475 | 020 | .091 | .020 | .102 | .025 | .063 | .025 | .051 | | | | | | |
| 4S10-1 | 025 | .072 | .025 | .091 | .025 | .051 | .025 | .042 | | | | | | |
| Airlock Fasteners | | | | | | | | | | | | | | |
| #2 | 025 | .091 | .025 | .102 | .016 | .080 | .016 | .063 | .016 | .040 | | | | |
| #5 | 025 | .091 | .025 | .102 | .025 | .063 | .025 | .051 | .020 | .051 | | | | |
| #7 | 032 | .091 | .025 | .102 | .025 | .051 | .025 | .051 | .032 | .051 | | | | |
| Dzus Fasteners | | | | | | | | | | | | | | |
| F-4 Spring W/Grommet | 032 | .072 | 032 | .080 | .025 | .063 | .025 | .063 | | | | | | |
| F-4 Srping W/O Grommet | 025 | .072 | 025 | .080 | .025 | .063 | .025 | .063 | | | | | | |
| FA-5 Spring | 032 | .080 | 032 | .091 | .025 | .063 | .025 | .063 | | | | | | |
| FA-5 Stud | 032 | .072 | 032 | .091 | .025 | .063 | .025 | .063 | | | | | | |
| FA-6-1/2 Spring | 032 | .063 | 032 | .091 | .025 | .063 | .025 | .051 | | | | | | |
| FA-6-1/2 Stud | 032 | .072 | 032 | .091 | .025 | .063 | .025 | .051 | | | | | | |

NOTE: The required metal thickness range is from the smaller number shown, or thinner, to the larger number shown, or thicker.

3.6 Performance. The machine covered herein shall be capable of forming dimples of the types and sizes and in materials of the thickness ranges shown in Table II. The production rate, workpiece stretch, distortion, contour, geometry, and visual defects shall conform to 3.6.1 through 3.6.4.

3.6.1 Production rate. The machine shall be capable of forming 8, or more, dimples per minute when forming dimples for 1-1/4 inch rivets in 0.102 inch thick alloy 7075-T6 aluminum sheet. The machine shall be capable of forming 6, or more, dimples per minute when forming dimples for 1/4 inch rivets in 0.063 inch thick titanium alloy and any of the compositions shown in Table II.

3.6.2 Workpiece stretch and distortion. When tested in accordance with 4.5, the "stretch" of the workpiece shall not exceed 0.020 inch when using standard die sets, and 0.008 inch when using optional "pressure pad" type die sets. The distortion of the workpiece, as measured by its concavity or convexity, shall not exceed 0.015 inch.

3.6.3 Contour and geometry. When the machine is used with proper predrilling, deburring, and post-drilling equipment, and when all preselectable controls are adjusted in accordance with the machine manufacturer's recommendations, the formed dimple shall have the proper geometry and contour to allow the applicable type of fastener to seat in the dimple with the conical surface of the head properly contacting the dimple and with the top surface flush within plus or minus 0.005 inch of the surrounding metal.

3.6.4 Visual defects. When examined with a 30 power magnifier, there shall be no evidence of cracks on the dimple or any other visual defects.

3.7 Standard equipment. Unless otherwise specified (see 6.2.1), the following equipment shall be furnished with each machine.

One set of hand tools and die alignment fixtures, normally furnished by the manufacturer with his commercial machines.

3.8 Optional equipment. Optional equipment shall be furnished as specified and as fully described (see 6.2.1).

3.9 Fungus control. When required (see 6.2.1), fungus proofing shall be as specified.

3.10 Lubrication chart or plate. Unless otherwise specified (see 6.2.1), a lubrication chart or plate shall be permanently and securely attached to each machine. If a chart is furnished, it shall be placed in a transparent plastic folder, or permanently sealed between clear plastic sheets, with suitable means for mounting. The following information shall be furnished on the chart or plate:

Points of lubricant application
Service interval
Type of lubricant
Viscosity
Military or Federal Specification number covering required lubricants

If there are no points on the machine requiring lubrication, the chart or plate shall be inscribed "No lubrication necessary" in lieu of the above required information.

3.11 Nameplate. A corrosion-resistant metal nameplate shall be securely attached to each machine. The nameplate shall contain the information listed below. If the machine is a special model, the model designation shall include the model of the basic standard machine and a suffix identified to the manufacturer's permanent records.

Nomenclature
Manufacturer's name
Manufacturer's model designation
Manufacturer's serial number
Power input (volts, amps, phase, frequency)
Contract or order number
National Stock Number or Plant Equipment Code
Date of manufacture

3.12 Technical data. Technical data shall be furnished as specified (see 6.2.2).

3.13 Workmanship. Workmanship of the machine and accessories shall be commensurate with the requirements specified herein and shall be of a quality equal to that of the manufacturer's commercial equipment of the type specified herein.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification when such action is deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 First article inspection. When first article inspection is required, it shall be applied to the first article submitted in accordance with 3.1. Unless otherwise specified (see 6.2.1), first article inspection shall consist of the examination in 4.4 and all tests in 4.5. Failure of the item to pass the first article tests shall be cause for rejection.

4.3 Quality conformance inspection. Each machine shall be subjected to quality conformance inspection prior to being offered for acceptance. Unless otherwise specified (see 6.2.1), quality conformance inspection shall consist of the examination in 4.4, the tests in 4.5.1 and 4.5.2 and the inspection in 4.6. Failure of the machine to pass any examination, test or inspection shall be cause for rejection.

4.4 Examination. The machine and equipment shall be examined to determined compliance with the requirements specified herein.

4.5 Tests.

4.5.1 Operational tests. The machine shall be operated, without forming dimples, for not less than 30 minutes. Proper operation of all controls, adjusting mechanisms and accessories shall be verified during the trial period. All hydraulic and pneumatic devices shall be inspected for leakage.

4.5.2 Performance tests. A flat piece of 3"x12" alloy 7075-T-6 aluminum sheet, of 0.051 inch nominal thickness, shall be used for the workpiece. A straight line shall be scribed along one long side of the piece 3/8" from the edge. The scribed line shall be centerpunched for fourteen dimples uniformly spaced and symetrical to the 3" axis. Pilot holes of the proper diameter for forming dimples for #10x32 screws conforming to MS-24694 shall be drilled. The proper dies for forming dimples for #10x32 screws shall be installed and properly aligned. All machine controls shall be adjusted in accordance with instructions in the manufacturer's operation manual. Prior to forming the dimples, the length of the test piece, along the scribed centerline, shall be measured and recorded for comparison with the same dimension after the test. The method of making these measurements shall be at the option of the manufacturer provided that the measurement is to an accuracy of ±0.001 inch. The following tests shall be performed.

4.5.2.1 Stretch test. A dimple shall be formed for a #10x32 screw in each of the fourteen holes in the workpiece. After all dimples have been formed, the length of the workpiece shall be measured along the scribed centerline. This measurement shall be compared to the same measurement taken before the test. The stretch of the workpiece shall not exceed 0.020 inch when using standard die sets and 0.008 when using option "pressure pad" type die sets.

4.5.2.2 Distortion. The test piece produced during the stretch test shall be measured for convexity or concavity. The convexity or concavity of the sample, measured across the 12" span, shall not exceed 0.015 inch.

4.5.2.3 Contour and geometry. All of the dimples shall be inspected for contour and geometry in accordance with accepted industry practice. All dimples shall meet accepted industry standards for contour and geometry.

4.5.2.4 Cracks and other visual defects. All of the dimples shall be examined under a 30 power magnifier for evidence of cracks, fractures, or other visual defects. There shall be no visible evidence of these defects in any of the dimples.

4.5.2.5 Bend test. After dimpling, the test piece shall be placed in a vise gripping across the centerline of the dimple and bent through the dimple as well as the undimpled area. At least two dimples shall be broken in each direction. The broken parts shall be examined in accordance with industry practice for evidence of radial and circumferential cracks or fractures.

4.5.3 Optional performance tests. When specified (see 6.2.1), the following additional tests shall be performed. A dimple shall be formed for the smallest and largest size for each type of fastener and for both minimum and maximum thicknesses of each of the materials as specified in Table II. Each formed dimple shall conform to the requirements of 3.6.3. The dimpled test pieces shall be tested in accordance with 4.5.2.4 and 4.5.2.5.

4.6 Packaging inspection. Packaging shall be inspected to determine compliance with the requirements of Section 5.

5. PACKAGING

5.1 Packaging - packing and marking. Unless otherwise specified, packaging, packing and marking shall be in accordance with ASTM Standard D-3951. When required, level A packaging and level A or B packing and marking shall be in accordance with the applicable requirements of MIL-M-18058. The required levels and special markings, if required, shall be as specified (see 6.2.1).

6. NOTES

6.1 Intended use. The machine is intended to be used primarily for dimpling aircraft grades of aluminum and magnesium, and are also capable of dimpling the more readily formed grades of stainless steels and titanium.

6.2 Ordering data.

6.2.1 Procurement requirements. Purchasers should specify their requirements in procurement documents, including whether each choice is required or not required, by entering an appropriate statement identified to each of the following:

a. Title, number, and date of this specification.
b. First article approval, if required (see 3.1).
c. Exceptions and additional safety and health requirements (see 3.2.2 and 6.4).
d. Painting, if different (see 3.3.5).
e. Measurement system, if different (see 3.2.5).
f. Type and quantity of die sets, if different (see 3.4.3).
g. Machine designed to utilize and equipped with ram coin pressure pad type die sets, if required (see 3.4.3).
h. Electrical system, if different (see 3.4.5).
i. Machine designed to utilize and equipped with portable die heater control systems, if required (see 3.4.5.4).
j. Mechanism to prevent die closure, if required (see 3.4.6).
k. Optional equipment, if different (see 3.8).
l. Type fungus proofing, if required (see 3.9).
m. Lubrication chart, if different (see 3.10).
n. Nameplate, if different (see 3.11).
o. First article inspection, if different (see 4.2).
p. Quality conformance inspection, if different (see 4.3).
q. Optional performance test, if required (see 4.5.3).
r. Military packaging, packing and special marking, if required (see 5.1.) (Specify level A packaging, specify level A or B packing and specify special marking if required).

6.2.2 Contract data requirements. Required technical data, such as operators manuals, parts lists, wiring diagrams, and other instruction for operation and maintenance as identified on DD Form 1664 Contract Data Requirements should be specified on a DD Form 1423 Data Item Description incorporated into the contract.

6.3 First article. When a first article is required, it shall be tested and approved under the appropriate provisions of 7-104.55 of the Defense Acquisition Regulation. A first article comprises a production item or a standard production item from the contractor's current inventory. The contracting officer should include specific instructions in all procurement instruments, regarding arrangement for examination, test and approval of the first article.

6.4 Safety and health requirements. Paragraph 3.2.3 requires compliance only with those OSHA requirements that concern the machine itself. It does not require compliance with those OSHA requirements that concern "the machine in its operating environment" such as noise levels, radiation levels, electromagnetic emissions, noxious vapors, air contaminants, heat, etc. Since OSHA limits the total level of these hazards in the environment (and does not limit the hazard level of individual machines in the environment) the requesting activity is advised to analyze the existing hazard levels in the proposed operating environment, and specify additional machine requirements that will integrate the new machine into its future operating environment. If specific point-of-operation guarding is required, the requesting activity should specify the exact configuration of the guard required, as in most cases, the guard configuration is dependent

on the size and configuration of the workpieces. The above, and any other additional safety and health requirements, should be specified in detail under 6.2.1(c).

6.5 Prohibited use of cadmium. The dimpling machines covered herein are intended for use in the construction and maintenance of aircraft parts fabricated of titanium and its alloys. The use of cadmium, or cadmium plated parts is prohibited. (See 3.2.1)

6.6 Cadmium plated tools. Cadmium can adversely affect the strength of titanium. For example, cadmium plated tools can deposit sufficient amounts of cadmium to cause an interaction of the metals and to seriously weaken the titanium part. Therefore, do not use cadmium plated tools in any area of the aircraft that contains titanium. (See 3.2.1)

6.7 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to previous issue, due to the extensiveness of the changes.

Custodians:
Navy - AS
Air Force - 99

Review Activities:
Air Force - 84
Navy - AS
DLA - GS

Preparing Activity:
DLA - IP

Project Number:
3448-0007

☆U.S. GOVERNMENT PRINTING OFFICE: 1984—705-040/A1562

# STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

*(See Instructions – Reverse Side)*

| | |
|---|---|
| 1. DOCUMENT NUMBER MIL-D-80251A | 2. DOCUMENT TITLE Dimpling Machines, Hot and Cold Process, Squeeze Type, Floor Mounted |
| 3a. NAME OF SUBMITTING ORGANIZATION | 4. TYPE OF ORGANIZATION *(Mark one)*<br>☐ VENDOR<br>☐ USER<br>☐ MANUFACTURER<br>☐ OTHER *(Specify)*: _____ |
| b. ADDRESS *(Street, City, State, ZIP Code)* | |

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

| | |
|---|---|
| 7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional | b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional |
| c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional | 8. DATE OF SUBMISSION *(YYMMDD)* |

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