

Flap Assemblies, Rotary Flap Peening

RATIONALE

AS2592A results from a Five-Year Review and update of this specification with changes to 1. Scope, 3.1.2 Construction, 3.1.3 Shot Material, 3.1.4.1 and 3.1.4.2 Flap Material, 3.2 Mandrels, 3.2.1 Mandrel Material, 3.3 Sleeves, 3.4 Dimensional Inspection, 4.2 Lot Definition, 4.3.1 Sampling of Flaps, 4.4.1 and 4.4.2 Flaps, 4.5 Reports, and Figures 1 through 5.

1. SCOPE

This Aerospace Standard covers components of rotary flap assemblies to be used with portable equipment for peening of metal parts.

The flap assemblies consist of a flap attached to a mandrel and shall be of the following sizes.

Table 1 - Flap assembly sizes

Mandrel with 9/16 x 1 inch (14 x 25 mm) flaps, see Figure 1
Mandrel with 9/16 x 1-1/4 inch (14 x 32 mm) flaps, see Figure 2
Mandrel with 1 x 2 inch (25 x 51 mm) flaps, see Figure 3

1.1 Intended Use

Flap assemblies are used for rotary flap peening, a portable method used to induce surface compressive stresses in metal parts as detailed in AMS2590. The flap is rotated rapidly and manually forced against a substrate being peened. A portion of the flat face of each flap embedded with shot strikes the metal surface causing peening.

2. APPLICABLE DOCUMENTS

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2590 Rotary Flap Peening of Metal Parts

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be revised, reaffirmed, stabilized, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2019 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER:
 Tel: 877-606-7323 (inside USA and Canada)
 Tel: +1 724-776-4970 (outside USA)
 Fax: 724-776-0790
 Email: CustomerService@sae.org
<http://www.sae.org>

SAE WEB ADDRESS:

Full document details: SAE AS2592A

SAE values your input. To provide feedback on this Technical Report, please visit <http://standards.sae.org/AS2592A>

Documents
Document Sharing Hub

3. TECHNICAL REQUIREMENTS

3.1 Design

Each flap assembly component shall be designed with optimum ergonomics and assure operator safety. Each flap assembly component shall be of such size, material, and strength as to endure without failure the maximum stresses imposed during use with an adequate factor of safety.

3.1.1 Interchangeability

Flaps and mandrels manufactured to this standard shall permit assembly of detail parts without modification regardless of manufacturer. The flaps shall be easily replaceable in the mandrels.

3.1.2 Construction

The flap assembly shall be assembled from a steel mandrel (see 3.2) and a flap inserted in the slot of the mandrel. The two halves of the flap shall be bonded together and shall have tungsten carbide shot embedded in the ends.

3.1.3 Shot Material

The shot shall be metallic carbide with a nominal composition of 94% tungsten carbide and 6% cobalt. The nominal size of the shot to be used shall be 0.045 inch $\pm$ 0.003 inch (1.10 mm $\pm$ 0.07 mm) diameter. The sphericity of the shot shall be not more than $\pm$ 0.003 inch ($\pm$ 0.07 mm) out of round. The shot shall have a Vickers microindentation hardness of 1710 $\pm$ 275 determined in accordance with ASTM E384, or Rockwell A hardness 91 $\pm$ 3 (with a 60 kg load) determined in accordance with ASTM E18.

3.1.4 Flap Material

The flap material shall be fabricated of a suitable synthetic material cloth supporting tungsten carbide shot embedded and bonded to the ends with a suitable thermosetting resin or adhesive that also stiffens the cloth. Suitability of material selected shall be established such that the requirements of 4.4 are met (see 8.2).

3.1.4.1 It is acceptable to trim the edges of the flap's synthetic material to allow the shots to more easily impact the part (see Figure 4).

3.1.4.2 It is also acceptable to cut the flap's synthetic material in rows from the edge to the flap to the edge of the joint to provide the flap with more compliance when rotary flapper peening complex geometries (see Figure 4).

3.1.5 Shot Distribution

The carbide shot shall be a single row of eight shot particles on the outer edges, as shown in Figure 1, or a double row of shot particles on the outer edges, as shown in Figures 2 and 3.

3.2 Mandrels

Mandrels shall be suitable for use in any electrical or pneumatic portable tool. Typical mandrel dimensions are shown in Figures 1, 2, or 3, as applicable for the specified flap size. A standoff guide illustrated in Figure 5, or equivalent, may be employed to help maintain the proper distance between the flap and the part.

3.2.1 Mandrel Material

The mandrel shall be fabricated from cold finished round carbon steel bar stock, drill rod, or corrosion resistant stainless steel of sufficient strength to preclude failure through fracture or bending when operated at the maximum operating speed for the process. All surfaces of the mandrel shall be smooth, free from burrs, sharp edges, or other harmful imperfections. The mandrel shall be nickel plated if the material is other than corrosion resistant stainless steel. When used, plating shall be complete and free from blisters or other defects which might adversely affect the serviceability of the mandrel.

3.3 Sleeves

The 1 x 2 inch (25 x 51 mm) flap, when used with the 3/8 inch (9.53 mm) diameter mandrel shall require two polymeric sleeves as illustrated in Figure 3 (see 8.3). No polymeric sleeves are required when using a 0.25 inch (6.35 mm) mandrel.

3.4 Dimensional Inspection

Each flap selected in accordance with 4.3 shall be dimensionally examined to verify compliance to Figures 1, 2, or 3.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspections

Unless otherwise specified, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may use their own or any other facilities suitable for the performance of the inspection requirements specified herein. The cognizant engineering organization reserves the right to sample and perform any testing deemed necessary.

4.2 Lot Definition

A lot is a group of flaps that are fabricated from the same batch of component details: shot, woven fabric, resin, and adhesive material, and presented for inspection at one time.

4.3 Sampling for Inspection

4.3.1 Sampling of Flaps

A random sample of three flaps shall be selected from each lot for dimensional inspection (3.4) and testing (4.4).

4.4 Flap Test and Inspection Procedure

4.4.1 Flaps 9/16 x 1 inch (14 x 25 mm) and 9/16 x 1-1/4 inches (14 x 32 mm)

The three flaps selected in accordance with 4.3 shall be individually mounted on a suitable mandrel and installed in a tool that will produce a rotational speed of 5000 rpm $\pm$ 200 rpm, with typical working flap deflection in accordance with AMS2590. The flaps shall be conditioned on a used test strip to remove the resin from the shot surface in accordance with AMS2590 prior to testing for 1 minute. For each flap, one new "A" test strip shall be attached to the magnetic strip holder and peened for 1 minute. The amount of arc height shall be measured and shall not be less than 0.010 inch (0.3 mm). The peening operation shall be repeated for 3 more minutes, using the same test strip and arc height measured. The amount of arc height shall not be less than 0.014 inch (0.4 mm). The peening operation shall be repeated for 1 more minute, using the same test strip. Each flap shall be visually examined. Not more than two particles of shot shall be missing from the flap. The flap shall be intact and shall show no indication of separation. If a flap fails this test and inspection procedure, the lot shall be subject to rejection.

4.4.2 Flaps 1 x 2 inches (25 x 51 mm)

The three flaps selected in accordance with 4.3 shall be individually mounted on a suitable mandrel and installed in a tool that will produce a rotational speed of 3000 rpm $\pm$ 100 rpm, with typical working flap deflection in accordance with AMS2590. The flaps shall be conditioned on a used test strip to remove the resin from the shot surface per AMS2590 prior to testing for 1 minute. For each flap, one new "A" test strip shall be attached to the magnetic strip holder and peened for 1 minute. The amount of arc height shall be measured and shall not be less than 0.010 inch (0.3 mm). The peening operation shall be repeated for 4 more minutes, using the same test strip and arc height measured. The amount of arc height shall not be less than 0.014 inch (0.4 mm). Each flap shall be visually examined. Not more than two particles of shot shall be missing from the flap. The flap shall be intact and shall show no indication of separation. If a flap fails this test and inspection procedure, the lot shall be subject to rejection.