

AEROSPACE RECOMMENDED PRACTICE

SAE ARP743

REV. C

Issued 1966-07
Revised 2001-03
Cancelled 2010-05

Superseding ARP743B

Procedure for the Determination of Particulate Contamination of Air in Dust Controlled Spaces by the Manual Particle Count Method

RATIONALE

FED-STD-791 referred to in the document has been cancelled and superseded by ISO 14644-1 and ISO 14644-2. The procedure in ARP743 cannot be used to count the smaller particle sizes identified in the ISO documents. Accordingly, ARP743 cannot be used to demonstrate compliance with the ISO documents.

CANCELLATION NOTICE

This document has been declared "CANCELLED" as of May 2010. By this action, this document will remain listed in the Numerical Section of the Aerospace Standards Index.

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 reaffirmed, revised, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2010 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 ARP743C](#)

**SAE values your input. To provide feedback
on this Technical Report, please visit
<http://www.sae.org/technical/standards/ARP743C>**

Documents
Document Sharing Hub

1. SCOPE:

- 1.1 This SAE Aerospace Recommended Practice (ARP) describes two procedures for sampling particles in dust controlled spaces. One procedure covers airborne dust above 5 μm . The other (and newly added procedure) covers particles of 25 μm and larger that “fall out” of the environment onto surfaces. In each case the particles are sized in the longest dimension and counted. Airborne particles are reported as particles per cubic meter (cubic foot) whereas particles collected in fall out samples are reported as particles per 0.1 square meter (square foot). This document includes English units in parentheses as referenced information to the SI units where meaningful.

These procedures may also be used for environmental analysis where the quality of the particles by visual or chemical analysis is intended.

1.2 Field of Application:

- 1.2.1 Airborne particle sampling (volumetric samples) - This procedure may be used in lieu of automatic particle counters for verifying conformance with FED-STD-209 for cleanroom classes above 10,000 unless the user or contracting agency specifies the counting of 0.5 μm particles. It may also be used for environmental analysis where the quality of the particles by visual identification is desirable.
- 1.2.2 This procedure can be used as a rough correlation check of particles greater than 5 μm when calibrating automatic particle counters.

1.3 Limitations and Errors:

- 1.3.1 This procedure is a slower alternative to the method by automatic particle counter, but necessary when the identification of particles is a concern.
- 1.3.2 This procedure is not appropriate when particles below 5 μm are of concern.

- 1.3.3 The procedures herein are not recommended to evaluate the residues that may collect on residue sensitive instruments such as optics and sensors. These residues, sometimes called non-volatile residue (NVR) or volatile condensable material (VCM) are best sampled by other means.
- 1.3.4 One source of error in these procedures is a poor distribution of particles on the membrane filter surface (see 3.8.6) while another is from errors occurring during the microscopic analysis.

2. REFERENCES:

2.1 Applicable Documents:

- 2.1.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.
- ARP598 Procedure for the Determination of Particulate Contamination of Hydraulic Fluids by the Particle Count Method
- 2.1.2 U.S. Government Publications: Available from DODSSP, Customer Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094. Fax requests to (215) 697-1462.
- FED-STD-209 Airborne Particulate Cleanliness Classes in Cleanrooms and Clean Zones

2.2 Definitions:

- 2.2.1 **CLEANROOM:** An enclosure or room built of and equipped with materials of low sloughing/dusting/linting potential. It is supplied with an over pressure of highly filtered air.
- The area is monitored with an automatic particle counter or the procedure herein to assure that the airborne particulate concentration is within prescribed limits. The most commonly used cleanroom requirements document is FED-STD-209.
- 2.2.2 **LAMINAR FLOW CLEANROOM:** A room, one wall or the ceiling of which, is a filter bank through which air flows laminarly across to the opposite wall or the floor which is an air return grating, or which is open to the uncontrolled environment ("tube" cleanroom).
- 2.2.3 **CONVENTIONAL FLOW CLEANROOM:** A fully enclosed room into which the air flows through a grating or gratings on one wall or around the room near the ceiling. The air exits through exhaust ducts near the floor.
- 2.2.4 **SEGMENTED SAMPLE TIME:** Sample time that is an accumulation of several sampling periods taken on the same membrane. Example a 24 h segmented sample may be an accumulation of three 8 h work shifts collected on one membrane.

3. TEST REQUIREMENTS:

3.1 Apparatus:

- 3.1.1 Aerosol Open Type Filter Holder, using 47 mm membrane filters, exposing $960 \text{ mm}^2 \pm 25 \text{ mm}^2$ of membrane surface to contamination (Note 1).
- 3.1.2 Air Flow Measuring Device (Note 2), accurate to $\pm 0.5 \text{ lpm}$ in the area of 10 lpm (0.35 cfm) at $50 \text{ torr} \pm 10 \text{ torr}$ below atmospheric pressure.
- 3.1.3 Membrane Filters, 0.45 to $1.2 \text{ }\mu\text{m}$ pore size, 47 mm diameter, having an imprinted grid on $3.10 \text{ mm} \pm 0.08 \text{ mm}$ centers. Each grid square is equal to approximately one hundredth of the total effective filtering area of the filter disc when used in the aerosol open-type filter holder (above). The membrane color shall be chosen to provide adequate contrast with the particulate contamination to be observed. The pressure drop through the membrane shall be $50 \text{ torr} \pm 10 \text{ torr}$ when sampling at 10 lpm (0.35 cfm).
- 3.1.4 Plastic Petri Dishes, 47 mm diameter, or other suitable device for mounting membrane filter specimen, capable of preventing contamination by atmospheric fallout during storage and examination.
- 3.1.5 Forceps with unserrated tips.
- 3.1.6 Rinse Dispenser (Note 3).
- 3.1.7 Vacuum Pump (Note 4), capable of moving 10 standard liters (0.35 standard cubic feet) of air per minute at observed operating pressure.
- 3.1.8 Particle Count Apparatus:
 - 3.1.8.1 Microscope, binocular or monocular (stereo microscopes shall not be employed with this procedure).
 - 3.1.8.2 Objectives and Oculars (eyepieces) in combinations to give magnifications of $50\text{X} \pm 10\text{X}$ and $100\text{X} \pm 10\text{X}$. The higher power objective shall have a minimum numerical aperture (N.A.) of 0.15 . The ocular shall not be greater than 15X .
 - 3.1.8.3 Ocular Micrometer, linear scale installed in one eyepiece. The smallest division shall not subtend a distance larger than the smallest particle to be counted at a particular magnification. A 10 mm scale with 200 equal divisions is known to be suitable when 10X and 4X objectives are used.
 - 3.1.8.4 Mechanical Stage, capable of traversing the entire area of the membrane filter. It shall have provision for holding a mounted membrane filter.
 - 3.1.8.5 Stage Micrometer, divisions of 0.1 mm and 0.01 mm .