



SURFACE VEHICLE RECOMMENDED PRACTICE

J1533™

JUL2022

Issued 1933-06
Revised 2019-07
Cancelled 2022-07

Superseded by J3078/2

Air Filter Element Test Method

RATIONALE

SAE J1533 is being cancelled and superseded by SAE J3078/2.

CANCELLATION NOTICE

This Technical Report has been declared "CANCELLED" as of July 2022 and has been superseded by SAE J3078/2. By this action, this document will remain listed in the respective index, if applicable. Cancelled Technical Reports are available from SAE.

SAENORM.COM : Click to view the full PDF of J1533_202207

SAE Executive Standards Committee 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 © 2022 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:

For more information on this standard, visit
https://www.sae.org/standards/content/J1533_202207/

FOREWORD

It is difficult, if not impossible, to select a generic calculation that would enable one to determine the exact size of filter for all applications. Determining factors that shall be taken into consideration are:

- a. The amount of fresh air required to maintain operator enclosure pressurization.
- b. The quantity of conditioned air that will be recirculated and provisions to control the amount of recirculation.
- c. The air handling units' (blowers') ability to produce an adequate amount of flow to overcome the resistance of the ductwork and filtration system.

1. SCOPE

This SAE test method establishes a uniform test procedure for determining the gravimetric (mass based) efficiency and pressure drop performance levels of operator enclosure panel type filters on off-road, self-propelled work machines used in earth moving, and forestry, as defined in SAE J1116 and for agricultural equipment as defined in ANSI/ASAE S390, and equipped with an operator enclosure with a powered fresh air system. ISO/TS 11155-1 may additionally be used, which describes the use of particle sizing devices to measure the fractional (particle size) efficiency of panel type filters for automotive cabin filter applications. Automotive cabin filters are similar to filters described in this procedure, and the ISO/TS 11155-1 test method is therefore directly applicable.

SAENORM.COM : Click to view the full PDF of J1533-202207

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 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.

SAE J1116 Categories of Off-Road Self-Propelled Work Machines

2.1.2 ISO Publications

Copies of these documents are available online at <http://webstore.ansi.org/>.

ISO 5011 Inlet Air Cleaning Equipment for Internal Combustion Engines and Compressors - Performance Testing

ISO 10263-2 Earth-Moving Machinery - Operator Enclosure Environment

ISO 12103-1 Road Vehicles - Test Dust for Filter Evaluation

ISO 14269-4 Tractors and Self-Propelled Machines for Agriculture and Forestry - Operator Enclosure Environment

ISO TS 11155 Road Vehicles - Air Filters for Passenger Compartments - Part 1: Test for Particle Filtration

ANSI/SAE S390.6 (ISO 12934:2013), Tractors and Machinery for Agriculture and Forestry - Basic Types - Vocabulary

3. DEFINITIONS

3.1 OPERATOR ENCLOSURE AIR FILTER ELEMENT

A medium in which particulate matter is removed from the incoming air supply.

3.2 FILTER EFFICIENCY

Measure of the ability of the air filter element to remove particulate matter.

3.3 TEST DUST

Particulate matter used to evaluate the filter element.

3.4 The air filter efficiency, E, as a percentage, is calculated as follows:

$$E = \frac{m_F}{m_F + m_A} \times 100 \quad (\text{Eq. 1})$$

where:

m_F = the increase in mass of the filter element under test

m_A = the increase in mass of the absolute filter

4. AIR FILTER ELEMENT PERFORMANCE TEST

The test shroud configurations for the operator enclosure filter comparison tests are outlined in 4.1.1 and Figure 1. This test procedure also designates a recommended intake velocity in 4.2.6 for the dust mixing chamber (see Figure 1).

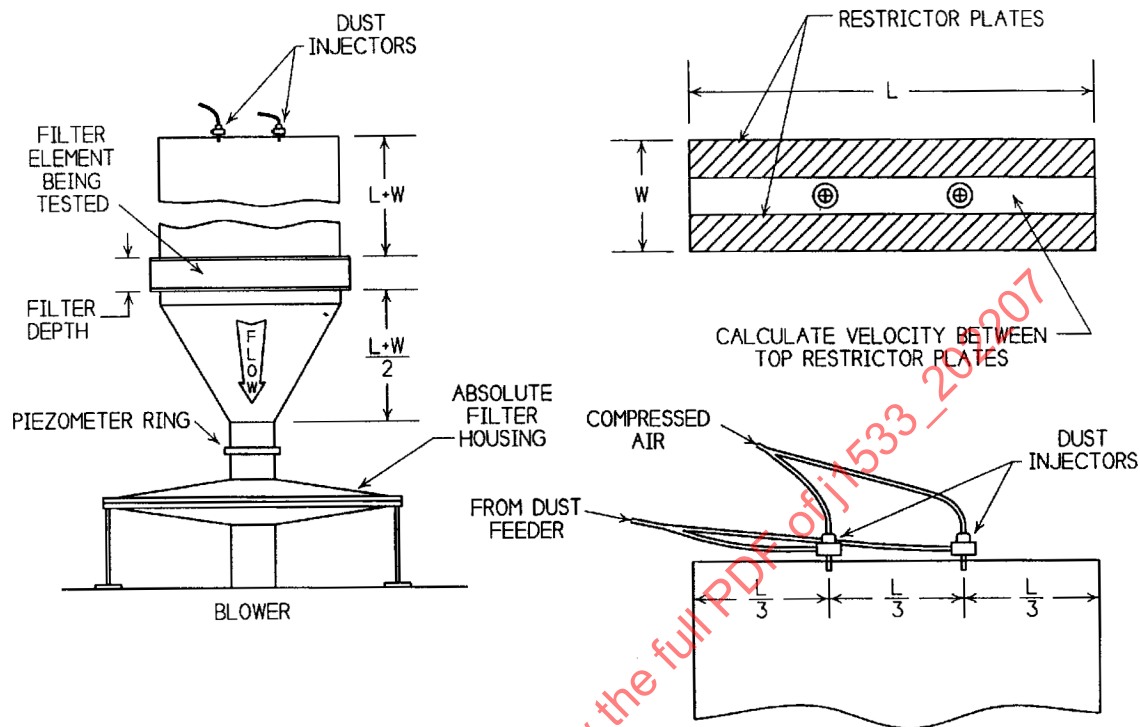


Figure 1 - Test shroud

4.1 Test Equipment and Instrumentation

- 4.1.1 Air flow restriction and pressure drop test is to be conducted using a minimum of five points, 25%, 50%, 75%, 100%, and 125% of rated air flow (use element restriction test setup shown in Figure 2). Condition the unit to be tested at least 30 minutes under temperature and humidity conditions equivalent to those in the test area.

To determine the resistance to air flow, particulate holding capacity, particulate removal efficiency, and sealing characteristics, use the equipment described in Figure 2. For element configurations other than panel type, refer to ISO 5011.

- 4.1.2 Use a dust metering device (see Figure 3) which when used with the dust injector (see Figure 4) is capable of metering dust over the range of delivery rates required. This dust feed system shall not change the primary particle size distribution of the particulate. The average delivery rate shall be within 5% of the desired rate and the deviation in the instantaneous delivery rate from the average shall be no more than 5%.

4.2 Test Conditions and Material

4.2.1 Standard Condition

All air flow measurements are to be corrected to a standard condition of 25 °C at 100 kPa absolute.

4.2.2 Test Dust

Shall be standardized and shall be of two grades labeled ISO 12103-A2 (ISO Fine) and ISO 12103-A4 (ISO Coarse).

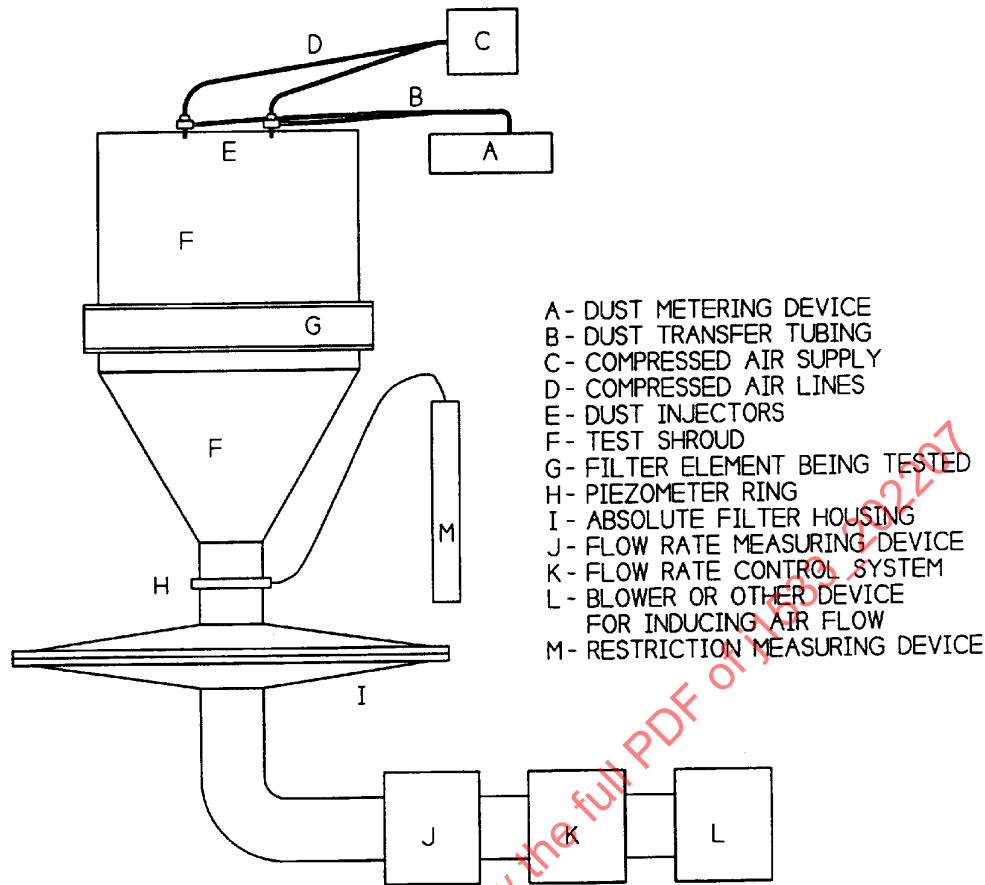


Figure 2 - Efficiency/capacity air filter element test setup

4.2.3 Absolute Filter Materials

The absolute filter shall consist of fiberglass media with a minimum thickness of 12.7 mm and a minimum density of 9.5 kg/m³. The fiber diameter shall be 0.76 to 1.27 μm and the moisture absorption shall be less than 1% by weight after exposure of 50 °C and 95% relative humidity for 96 hours. The filter shall be installed with the nap side facing upstream in an air-tight holder that adequately supports the media. The face velocity shall not exceed 50 m/min to maintain media integrity.

4.2.4 Absolute Filter Weight

The absolute filter shall be weighed to the nearest 0.01 g after the weight has stabilized and while in a ventilation oven at 105 °C ± 5 °C.

4.2.5 Temperature and Humidity

All tests shall be conducted with air entering the air filter at a temperature of 24 °C ± 8 °C and a relative humidity of 50% ± 15%.

NOTE: Since atmospheric conditions affect test results, when comparing performance of filters designed for the same application, tests should be conducted within the narrowest range of temperature and humidity possible.

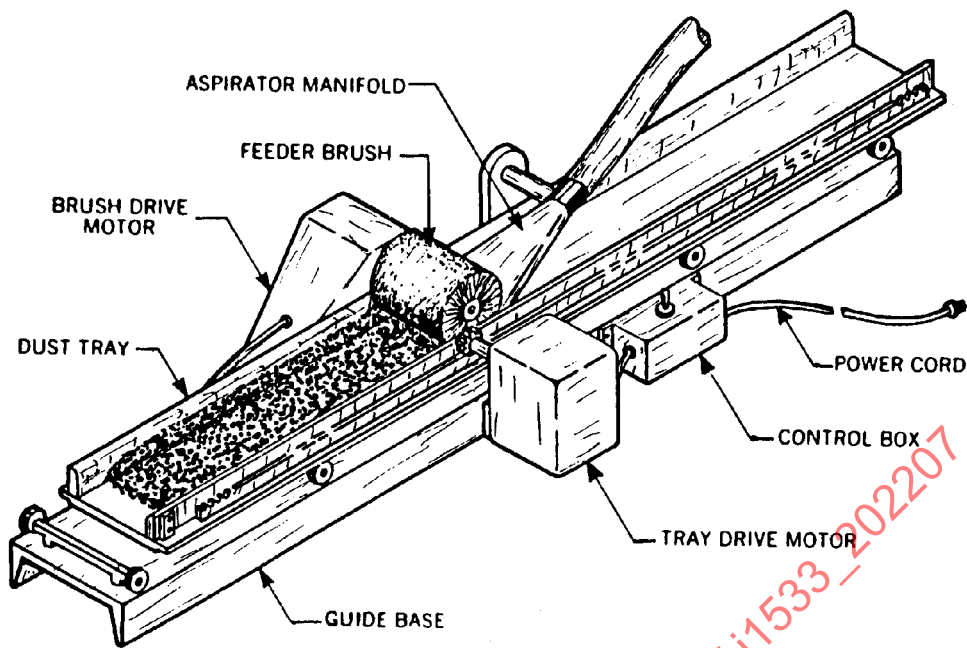


Figure 3 - Dust feeder (detail drawing available from ISO 5011 test code subcommittee)

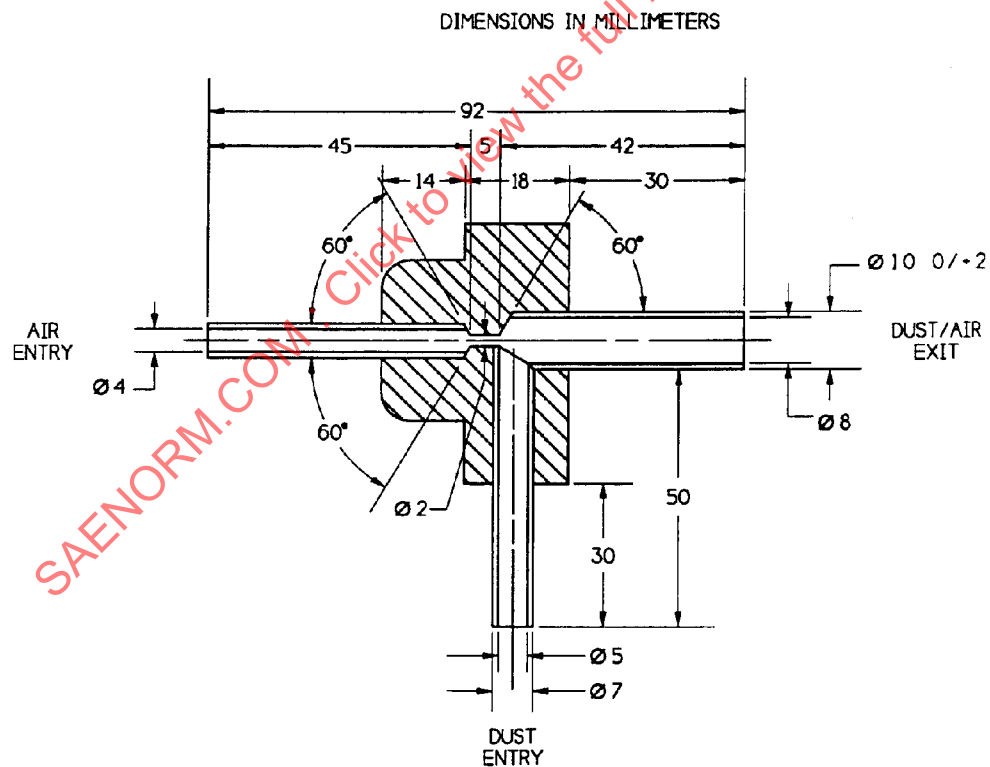


Figure 4 - Dust injector