

SPECIFICATION FOR
AIR FILTERS
FOR AIR SUPPLY TO
INTERNAL COMBUSTION ENGINES
AND COMPRESSORS
OTHER THAN FOR AIRCRAFT

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The Institution desires to call attention to the fact that this British Standard does not purport to include all the necessary provisions of a contract.

A complete list of British Standards, numbering over 5000, fully indexed and with a note of the contents of each, will be found in the British Standards Yearbook, price £1. The BS Yearbook may be consulted in many public libraries and similar institutions.

This standard makes reference to the following British Standards:

BS 1042. Code for flow measurement.

BS 1796. Methods for the use of fine mesh sieves.

BS 2806. Limiting dimensions of air filters for internal combustion engines and compressors other than for aircraft.

BS 2831. Methods of test for air filters used in air-conditioning and general ventilation.

BS 3406. Methods for the determination of particle size of powders.

Part 1. Sub-division of gross sample down to 0.2 ml.

Part 2. Liquid sedimentation methods.

BS 3928. Sodium flame test for air filters (other than for air supply to i.c. engines and compressors).

The following BSI references relate to the work on this standard:
Committee reference MEE/95/2 Draft for comment 68/19255

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CO-OPERATING ORGANIZATIONS

The Mechanical Engineering Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

Associated Offices' Technical Committee
Association of Consulting Engineers
Association of Mining Electrical and Mechanical Engineers
Board of Trade
British Chemical Plant Manufacturers' Association
*British Compressed Air Society
British Electrical and Allied Manufacturers' Association
British Gear Manufacturers' Association
*British Internal Combustion Engine Manufacturers' Association
British Mechanical Engineering Confederation
British Pump Manufacturers' Association
British Steel Industry
Crown Agents for Oversea Governments and Administrations
Department of Employment and Productivity
Electricity Council, the Central Electricity Generating Board and the Area Boards in England and Wales
Engineering Equipment Users' Association
Gas Council
Institute of Marine Engineers
Institution of Civil Engineers
Institution of Gas Engineers
Institution of Heating and Ventilating Engineers
*Institution of Mechanical Engineers
Institution of Mechanical Engineers (Automobile Division)
Institution of Production Engineers
Locomotive and Allied Manufacturers' Association of Great Britain
London Transport Board

Machine Tool Trades Association

*Ministry of Defence

Ministry of Power

*Ministry of Public Building and Works

Ministry of Technology — National Engineering

Laboratory

Ministry of Transport

National Coal Board

National Physical Laboratory — Ministry of Technology

Royal Institute of British Architects

The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

Motor Industry Research Association

National Institute of Agricultural Engineering

Society of British Aerospace Companies Ltd.

Society of Motor Manufacturers and Traders Ltd.

Individual filter manufacturers

BRITISH STANDARD SPECIFICATION FOR
AIR FILTERS FOR AIR SUPPLY
TO INTERNAL COMBUSTION ENGINES AND
COMPRESSORS OTHER THAN FOR AIRCRAFT

FOREWORD

This British Standard has been prepared under the authority of the Mechanical Engineering Industry Standards Committee.

The principal features of this revision are the inclusion of an additional fine test dust, since experience has proved that such a dust is frequently specified by engine and equipment manufacturers, based on the SAE fine dust, and the inclusion of determination of efficiency by master filter.

Attention is drawn to BS 2806, 'Limiting dimensions of air filters for internal combustion engines and compressors other than for aircraft', which specifies limiting dimensions for filters complying with the efficiency grades in this Standard.

NOTE. Where metric equivalents are stated, the figures in imperial units are to be regarded as the standard. The metric conversions are approximate. More accurate conversions should be based on the tables in BS 350, 'Conversion factors and tables'.

SPECIFICATION

1. GENERAL

1.1 SCOPE

This British Standard specifies requirements for six grades (see 2.3) of filters for air supply to internal combustion engines and compressors (other than those used in aircraft) and covers the following types, of which typical examples are shown in Figs. 1 to 6:

- | | |
|--------------------------------|----------|
| (1) Dry medium | (Fig. 1) |
| (2) Viscous | (Fig. 2) |
| (3) Inertial | (Fig. 3) |
| (4) Centrifugal (cyclone) | (Fig. 4) |
| (5) Oil bath | (Fig. 5) |
| (6) Paper element | (Fig. 6) |
| (7) Combinations of (1) to (6) | |

Section 2 defines filter conditions and performance. Section 3 sets out the type tests for filters covered by this standard.

Users should satisfy themselves that the capacity of filters tested in accordance with the methods laid down in this standard is adequate for their requirements. The dust capacity for which the filter has been designed shall be stated on the filter.

The methods of test in this standard assume non-pulsating air flows. It should be noted that the performance may be substantially different if there are marked pulsations. This may involve check testing of the air filter installed on the engine or compressor concerned.

NOTE. It should be noted that paper element filters are liable to premature clogging when subjected to environments containing concentrations of oil mist, exhaust carbon, or other fine particles.

1.2 CONSTRUCTION

The filter shall be capable of withstanding normal mechanical stresses encountered in service. The use of dissimilar metals, especially brass, copper or steel in contact with aluminium or aluminium alloy, shall be avoided wherever possible.

The portion of the filter which contains cleaned air shall be free from leaks and shall be airtight when tested at a pressure difference of 1 lbf/in² (0.07 bar*) for not less than 1 minute.

The filter shall be capable of withstanding flame and pressure, due to engine back-fires in spark-ignition engines, without damage. If the filter is likely to be subject to flow reversal, this may have a detrimental effect; then the filter shall be further tested as agreed between the purchaser and the manufacturer.

1.3 PROTECTIVE TREATMENT

All components of the filter susceptible to deterioration in service shall be suitably treated to prevent deterioration.

1.4 INTERCHANGEABILITY

Manufacturing tolerances on air filter components, of any particular design, shall ensure interchangeability and replacement without adversely affecting the specified performance.

*1 bar = 10⁵ N/m²

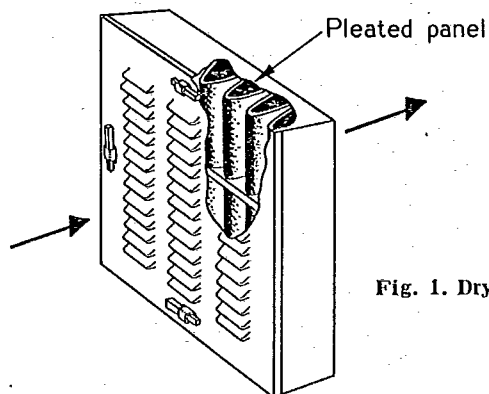


Fig. 1. Dry medium (panel or cylindrical)

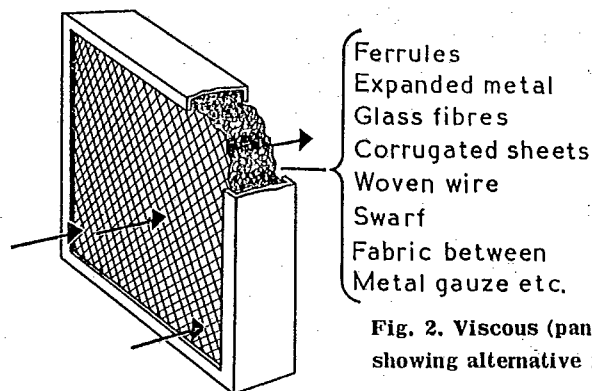


Fig. 2. Viscous (panel or cylindrical) showing alternative fillings (oil wetted)

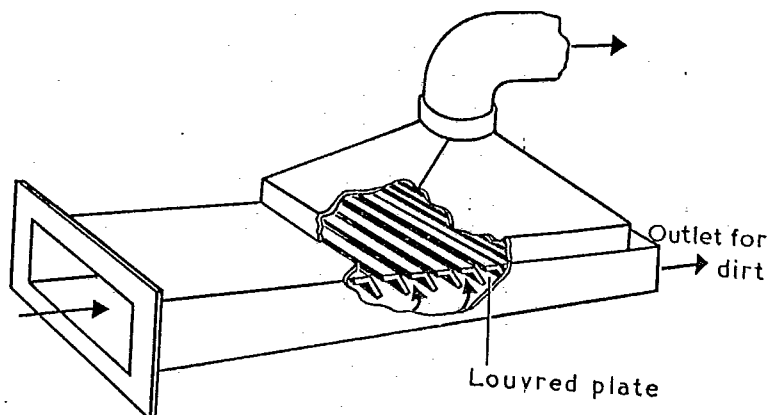


Fig. 3. Inertial

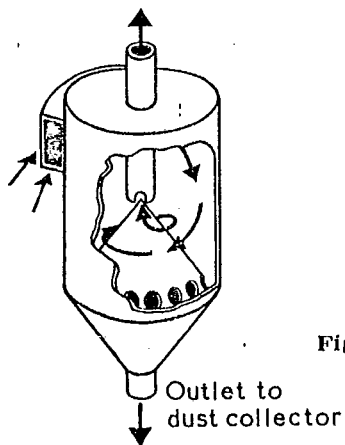


Fig. 4. Centrifugal (cyclone)

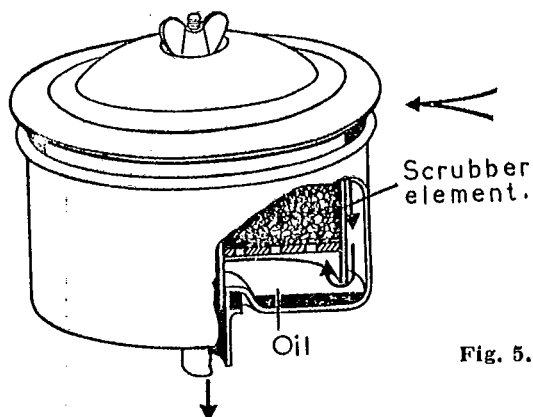


Fig. 5. Oil bath

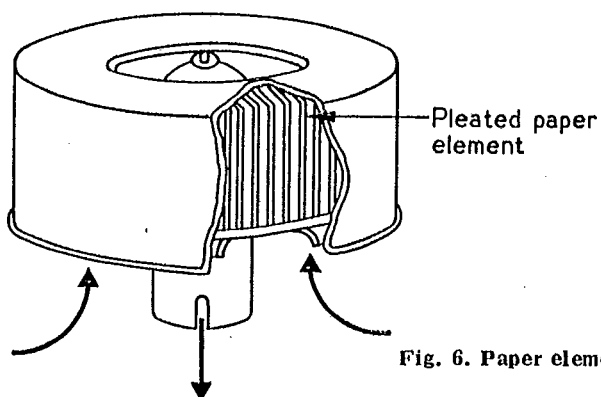


Fig. 6. Paper element

1.5 IDENTIFICATION MARKING AND SERVICING INSTRUCTIONS

1.5.1 Identification marking. The following information shall be permanently and legibly marked on the filter:

Manufacturer's name or trade mark.

Manufacturer's part No.

Dust capacity (g)

Max. air flow $\text{ft}^3/\text{min}(\text{m}^3/\text{min})(\text{level})$

Max. air flow $\text{ft}^3/\text{min}(\text{m}^3/\text{min})(\text{at } ^\circ\text{tilt})$

BS 1701 Efficiency grade

Pressure loss at maximum flow $\text{lbf/in}^2(\text{bar})$

NOTE. The mark BS 1701 on or in relation to the product is a claim by the manufacturer that it complies with the requirements of the standard. Attention is drawn to certification facilities offered by BSI; see the back cover of this standard.

1.5.2 Servicing instructions. Servicing instructions shall be permanently and legibly marked in a suitable position on the filter (see Appendix A).

For oil-bath filters, the oil level shall be clearly marked, and the words EXACT INITIAL OIL LEVEL shall be included, and detailed operating and servicing instructions shall be given in the engine manufacturer's handbook.

2. TEST PERFORMANCE

2.1 GENERAL

The filters shall comply with the appropriate requirements of 2.2 to 2.6 inclusive, with the condition of the filter as specified in 3.1.

2.2 AIR FLOW

The filter shall be capable of fulfilling the requirements of this standard at the maximum air flow for which it is designed (see 1.5.1).

2.3 EFFICIENCY

The mean dust-retaining efficiency, when determined in accordance with the test procedure specified in 3.6, shall be not less than 99 % for Grade CAA filters, 98 % for Grade CA filters, 96.5 % for Grade CB filters when using BS coarse dust and/or 99 % for Grade FAAA filters, 98 % for Grade FAA filters, 96 % for FA filters, and 93 % for FB filters,

when using BS fine dust, after each two-hour cycle. The specification of the test dusts is given in Appendix C.

This efficiency shall be determined by a dust-retaining test using the dust/air ratio for which the filter is designed (see 2.5 and 1.5).

The designed dust/air ratio* can be obtained from the formula:

Maximum dust/air ratio in milligrammes per cubic foot (m^3)

$$= \frac{1000 \times W}{300 \times V \times \eta}$$

where W = manufacturer's stated dust capacity in grammes,

V = manufacturer's stated maximum flow of air in ft^3 (m^3) per minute,

η = manufacturer's stated efficiency, based on unity.

The efficiency of the filter at various rates of air flow, when determined in accordance with the test procedure specified in 3.7, shall be not less than the percentages shown in Table 1.

An alternative method of testing efficiency is by the master filter method. Details of the test procedure are given in 3.8 and Fig. 13. This method may be used more easily with filters which do not retain the dust separated from the air stream but dispose of it by ejection or other means (see also Figs. 3 and 4).

*In special cases, the designed dust/air ratio may be stated in addition to the dust capacity, having the effect of extending the two-hour cycle tests beyond the four stipulated in 3.6.