

PUBLISHED DOCUMENT

Environmental cleanliness in enclosed spaces – Guide to in situ high efficiency filter leak testing

ICS 13.040.30



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ISBN 978 0 580 54666 2

The following BSI references relate to the work on this standard:

Committee reference LBI/30

Draft for comment 05/30123389 DC

Publication history

First published July 2000

Second edition published July 2007

Amendments issued since publication

Amd. no.	Date	Text affected
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Summary of pages

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Foreword

Publishing information

This Published Document is published by BSI and came into effect on 31 July 2007. It was prepared by Technical Committee LBI/30, *Cleanroom technology*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This Published Document supersedes PD 6609:2000, which is withdrawn.

Relationship with other publications

BS 5295:1989 (all parts) has been replaced by BS EN ISO 14644 (all parts). However, the withdrawn BS 5295:1989 contained information about in situ high efficiency filter testing using an oil aerosol challenge and a photometer that is not given in BS EN ISO 14644 (all parts). That information, which has been revised with respect to the new requirements in BS EN ISO 14644-3:2005, is published in this document.

Presentational conventions

The provisions in this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is “should”.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

0 Introduction

Where high efficiency filters are fitted, it is important to ensure that the filter and its housing and sealing device do not permit the ingress of particles into a cleanroom or clean zone. This is checked by challenging the filter with an aerosol of particles dispersed upstream of the filter and scanning over the downstream face, frame and gasket of the filter to ensure that there are no leaks that exceed a specified level of penetration.

The object of the in situ leak test described in this document is to determine if the filter has been damaged between manufacture and installation, and during subsequent use.

In situ testing with oil aerosols might not be acceptable for some cleanroom applications where airborne chemical contamination needs to be controlled, as oil deposited on the filter will outgas. In such cases, an alternative method that uses inert particles and a particle counter can be used. This method is not discussed in this document but is described in **B.6.3** of BS EN ISO 14644-3:2005.

1 Scope

This Published Document provides information supplementary to the provisions of BS EN ISO 14644-3:2005. In particular, it gives recommendations and explanatory guidance for in situ leak testing of high efficiency filters using an oil aerosol challenge and photometer. It also provides guidance on the procurement of replacement filters (Annex A) and information that might be required in a test report (Annex B).

The guidance contained in this document is for the leak testing of high efficiency air filters that can be face scanned. The document does not provide information on other tests carried out on high efficiency filters installed in cleanrooms, such as pressure differentials, air supply volumes, and airflow uniformity.

2 Normative references

BS EN ISO 14644-3:2005, *Cleanrooms and associated controlled environments – Part 3: Test methods*

3 Requirements for testing

3.1 Aerosol injection

The filter integrity test relies on a homogeneous distribution of aerosol test challenge upstream and across the whole filter face. Homogeneous distribution is defined as a variation in concentration of less than $\pm 15\%$ in time about the average measured value. The upstream aerosol challenge should be measured as close as possible to the filter, and ideally not more than 50 mm from the upstream face.

To ensure good mixing it is essential that the aerosol is injected correctly. For ducted systems, aerosol injection ports will normally be required. When injecting into long ducted systems with distribution legs along the main duct (see Figure 1), good mixing will not occur unless the distance D is at least 15 duct diameters. However the correct use of distribution sparge pipes may allow injection as near as one metre from the filter face to achieve homogeneous distribution of the challenge aerosol.

The aerosol injection point or port should be of sufficient size to accept the entry of the challenge aerosol and achieve the required upstream concentration. In some cases, oil aerosol injection pumps may be required to overcome the pressure in positive pressure ducts.

Where an aerosol challenge is injected upstream of an air conditioning unit, the refrigeration, heating and humidification circuits should be switched off to avoid attenuation of the aerosol challenge. Any pre-filters between the injection point and the high efficiency filter(s) should be removed prior to test.

The sample flow rate should always be maintained at the calibrated value of the sampling instrument being used. Where a filter is installed in a negative pressure extract duct and the photometer is unable to overcome the negative pressure in the duct then leaks will not be detected. To overcome this, the photometer may be used in a "differential sampling mode", if possible, where the exhaust of the photometer is returned to the exhaust duct.

Figure 1 **Diagram of an aerosol challenge to multiple filters via an air handling unit**

