

Measurement of airborne noise from hydraulic fluid power systems and components —

**Part 5: Simplified method of
determining sound power levels from
pumps using an anechoic chamber**

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- Association of Hydraulic Equipment Manufacturers
- British Compressed Air Society
- British Hydromechanics Research Association
- British Steel Corporation
- British Telecommunications
- Department of Trade and Industry (National Engineering Laboratory)
- Electricity Supply Industry in England and Wales
- Federation of Manufacturers of Construction Equipment and Cranes
- Health and Safety Executive
- Institution of Mechanical Engineers
- Machine Tool Industry Research Association
- Ministry of Defence
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The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- Bath University
- Institution of Production Engineers

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Foreword

This Part of BS 5944 has been prepared under the direction of the Machinery and Components Standards Committee and is one of a group of British Standards related to the measurement of noise emanating from hydraulic fluid power systems and components.

It is intended that this standard will unify testing methods and enable the performance of different pumps to be compared on a common basis.

The standard comprises the following Parts.

- *Part 1: Method of test for pumps;*
- *Part 2: Method of test for motors;*
- *Part 3: Guide to the application of Part 1 and Part 2;*
- *Part 4: Method of determining sound power levels from valves controlling flow and pressure.*

Further Parts are planned.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

0 Introduction

In hydraulic fluid power systems, power is transmitted and controlled through a liquid under pressure in a closed circuit. Pumps are components which convert rotary mechanical power into fluid power. During the process of converting mechanical power into hydraulic fluid power, airborne noise, fluid-borne vibrations and structure-borne vibrations are radiated from the pump.

The airborne noise level of a hydraulic fluid power pump is an important consideration in component selection. The noise measurement technique should, therefore, be such as to yield accurate appraisals of these airborne noise levels. The determination of noise levels is complicated by the interactions which occur during noise measurement. The fluid-borne and structure-borne vibrations from the pump can be transmitted to the circuit and ultimately give rise to background airborne noise levels which could affect the determination of the pump airborne noise levels.

The procedures described in this Part of BS 5944 are intended to measure only the airborne noise radiated directly from the pump under test.

This standard closely follows the methods described in BS 5944-1 and BS 5944-2 but allows the use of alternative pump mounting and drive configurations which are simpler and cheaper to implement in an anechoic chamber. Much of the guidance given in BS 5944-3 is equally applicable to this standard. The data obtained has been shown to be sufficiently accurate in industrial terms for frequency A weighted, octave and 1/3 octave noise measurements.

1 Scope

This Part of BS 5944 describes procedures for the determination of the sound power levels of a hydraulic fluid power pump, under controlled conditions of installation and operation, suitable for providing a basis for comparing the noise levels of pumps in terms of:

- a) A-weighted sound power level;
- b) octave band sound power levels.

From these sound power levels, sound pressure levels may be calculated for reporting purposes (see clause 11).

For general purposes, the frequency range of interest includes the octave bands with centre frequencies between 125 Hz and 8 000 Hz.

This method is applicable to all types of hydraulic fluid power pumps operating under steady-state conditions, irrespective of size, except for any limitations imposed by the size of the test environment (see clause 4).

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this Part of BS 5944, the definitions given in BS 661 apply together with the following.

2.1

free sound field

a sound field produced in a homogeneous, isotropic medium free of boundaries

NOTE In practice, it is a field in which the effects of the boundaries are negligible over the frequency range of interest.

2.2

free-field over a reflecting plane

a field produced by a source in the presence of one reflecting plane on which the source is located

2.3

free-field over two reflecting planes

a field produced by a source in the presence of two mutually perpendicular reflecting planes

2.4

anechoic room

a test room having boundaries which absorb essentially all of the incident sound energy over the frequency range of interest, thereby affording free-field conditions over the measurement surface

2.5

mean-square sound pressure

the sound pressure averaged in space and time on a mean-square basis

NOTE In practice, this is estimated by space and time averaging over a finite path length or over a number of fixed microphone positions.

2.6

mean sound pressure level (L_p)

ten times the logarithm to the base 10 of the ratio of the mean-square sound pressure to the square of the reference sound pressure in decibels (dB)

NOTE The weighting network or the width of the frequency band used should always be indicated; for example, A-weighted sound pressure level, octave band sound pressure level. The reference sound pressure is 20 μ Pa.

2.7

sound power level (L_w)

ten times the logarithm to the base 10 of the ratio of a given sound power to the reference sound power in decibels (dB)