

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

**Part 6: Method of test for pumps using a
parallelepiped microphone array**

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Machinery and Components Standards Policy Committee (MCE/-) to Technical Committee MCE/18, upon which the following bodies were represented:

- Advanced Manufacturing Technology Research Institute
- Association of British Mining Equipment Companies
- Bath University
- British Compressed Air Society
- British Fluid Power Association
- British Steel Industry
- Department of Trade and Industry (National Engineering Laboratory)
- Ministry of Defence

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- British Hydromechanics Research Association
- British Railways Board
- Society of Motor Manufacturers and Traders Ltd.

This British Standard, having been prepared under the direction of the Machinery and Components Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 December 1992

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National foreword

This Part of BS 5944 has been prepared under the direction of the Machinery and Components Standards Policy Committee. It is identical with ISO 4412-3:1991 *Hydraulic fluid power — Test code for determination of airborne noise levels — Part 3: Pumps — Method using a parallelepiped microphone array*, published by the International Organization for Standardization (ISO).

BS 5944 comprises the following Parts.

- *Part 1: Method of test for pumps;*
- *Part 2: Method of test for motors;*
- *Part 3: Withdrawn;*
- *Part 4: Method of determining sound power levels from valves controlling flow and pressure;*
- *Part 5: Simplified method of determining sound power levels from pumps using an anechoic chamber;*
- *Part 6: Method of test for pumps using parallelepiped microphone array.*

For the purposes of the British Standard the identification statement required by clause 14 may be replaced by the following:

“Airborne noise levels determined in accordance with BS 5944-6”

Cross-references

International Standard	Corresponding British Standard
ISO 3448:1975	BS 4231:1982 <i>Classification for viscosity grades of industrial liquid lubricants</i> (Identical)
ISO 3744:1981	BS 4196 <i>Sound power levels of noise sources</i> Part 4:1981 <i>Engineering methods for determination of sound power levels for sources in free-field conditions over a reflecting plane</i> (Identical)
ISO 6743-4:1982	BS 6413 <i>Lubricants, industrial oils and related products (Class L)</i> Part 4:1983 <i>Classification for family II (hydraulic systems)</i> (Identical)
IEC 651:1979	BS 5969:1981 <i>Specification for sound level meters</i> (Identical)

The Technical Committee has reviewed the provisions of ISO 5598:1985 to which reference is made in the text and has decided that they are acceptable for use in conjunction with this standard.

There are no corresponding British Standards for ISO 5598.

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.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

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.

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 measurements. 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 ISO 4412 are intended to measure only the airborne noise radiated directly from the pump under test.

This part of ISO 4412 closely follows the methods described in the two other parts, 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 ISO 4412-1:1991, Annex C, is equally applicable to this part of ISO 4412. The data obtained have been shown to be sufficiently accurate in engineering terms for A-weighted and one-third octave noise measurements, in decibels. This part of ISO 4412 may also be applied to the testing of motors.

1 Scope

This part of ISO 4412 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-weighted sound power level;
- one-third octave band power level.

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

For general purposes, the frequency range of interest includes the one-third octave bands with centre frequencies between 100 Hz and 10 000 Hz¹⁾.

¹⁾ 1 Hz = 1 s⁻¹

This part of ISO 4412 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 3).

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 4412. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 4412 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3448:1975, *Industrial liquid lubricants — ISO viscosity classification*.

ISO 3744:1981, *Acoustics — Determination of sound power levels of noise sources — Engineering methods for free-field conditions over a reflecting plane*.

ISO 5598:1985, *Fluid power systems and components — Vocabulary*.

ISO 6743-4:1982, *Lubricants, industrial oils and related products (class L) — Classification — Part 4: Family H (Hydraulic systems)*.

IEC 651:1979, *Sound level meters*.

3 Definitions

For the purposes of this part of ISO 4412, the definitions given in ISO 5598 and the following definitions apply. It is accepted that the latter definitions may differ from those in other specific International Standards.

3.1

free sound field

sound field in a homogeneous, isotropic medium free of boundaries

NOTE 1 In practice, it is a field in which the effects of the boundaries are negligible over the frequency range of interest.

3.2

free field over two reflecting planes

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

3.3

anechoic room

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