

Methods for

Performance tests for rotary and percussive pneumatic tools

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Mechanical Engineering Standards Committee (MEE/-) to Technical Committee MEE/39 upon which the following bodies were represented:

- BEAMA Ltd.
- British Compressed Air Society
- British Gas Corporation
- Construction Plant-hire Association
- Department of Trade and Industry (National Engineering Laboratory)
- Electricity Supply Industry in England and Wales
- Energy Industries Council
- Health and Safety Executive
- Imperial College of Science and Technology
- Institute of Marine Engineers
- Institution of Gas Engineers
- Institution of Mechanical Engineers
- Institution of Mining and Metallurgy
- Institution of Mining Engineers
- Ministry of Defence
- National Coal Board
- South Wales Institute of Engineers

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Contents

	Page
Committees responsible	Inside front cover
National foreword	ii
0 Introduction	1
1 Scope and field of application	1
2 References	1
3 Definitions	1
4 Symbols and units	2
5 Classification of pneumatic tools	3
6 Methods for measurement of tool performance data	4
Annex A Format for pneumatic tools test report — Rotary tool	8
Annex B Format for pneumatic tools test report — Percussive tool	9
Annex C Procedure for measurement of impact energy by the strain gauge method	11
Figure 1 — Use of air receiver	5
Figure 2 — Incident strain wave	13
Figure 3 — Strain gauge arrangement	15
Publications referred to	Inside back cover

National foreword

This revision of BS 5344, which has been prepared under the direction of the Mechanical Engineering Standards Committee, supersedes BS 5344:1976 which is withdrawn, it is identical with ISO 2787:1984, “*Rotary and percussive pneumatic tools — Performance tests*” which was prepared by Technical Committee ISO/TC29, Small tools, of the International Organization for Standardization (ISO) and in the development of which the United Kingdom played an active part.

The title of BS 5344 now refers to performance tests to reflect the corresponding change in the title of the second edition of ISO 2787.

Terminology and conventions. The text of the International Standard has been approved as suitable for publication as a British Standard without deviation. Some terminology and certain conventions are not identical with those used in British Standards; attention is drawn especially to the following.

The comma has been used as a decimal marker for metric dimensions. In British Standards it is current practice to use a full point on the baseline as the decimal marker.

Wherever the words “International Standard” appear, referring to this standard, they should be read as “British Standard”.

Cross references

International Standard	Corresponding British Standard
ISO 31	BS 5775 <i>Specification for quantities, units and symbols</i> (Identical)
ISO 1000:1981	BS 5555:1981 <i>Specification for SI units and recommendations for the use of their multiples and of certain other units</i> (Identical)
ISO 1180:1983 ^a	BS 673:1984 <i>Specification for shanks for pneumatic tools and fitting dimensions of chuck bushings</i> (Identical)
ISO 3857-1:1977	BS 5791 <i>Glossary of terms for compressors, flow in pneumatic tools and machines</i> Part 1:1979 <i>General</i> (Identical)
ISO 3857-3:1979	Part 3:1984 <i>Pneumatic tools and machines</i> (Identical)
ISO 5167:1980	BS 1042 <i>Methods of measurement of fluid closed conduits</i> Part 1.1:1981 <i>Orifice plates, nozzles and Venturi tubes inserted in circular cross-section conduits running full</i> (Technically equivalent)
ISO 5393:1981	BS 6292:1982 <i>Method for evaluation of performance of rotary pneumatic assembly tools for threaded fasteners</i> (Identical)
ISO 6544:1981	BS 6268:1982 <i>Method of measurement for reaction torque and torque impulse from hand-held pneumatic assembly tools for installing threaded fasteners</i> (Identical)

^a Footnote 1) on page 1 is invalid as the revision of ISO/R 1180 was published in 1983.

The Technical Committee has reviewed the provisions of ISO 2944, to which reference is made in the text, and has decided it is acceptable for use in conjunction with this standard.

There is no corresponding British Standard for ISO 5391 which is at draft stage.

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 to iv, pages 1 to 16, 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

This International Standard shows how information on hand-held pneumatic rotary tools, percussive tools and percussive tools with rotation should be obtained and presented.

Such information is valuable for the following purposes:

- a) to enable manufacturers of pneumatic rotary and percussive tools to offer their products under similar technical specifications;
- b) to help users to compare different tools and to select the right type and size for a specific task;
- c) to instruct test personnel about how performance tests shall be carried out, according to specified conditions described in this International Standard.

1 Scope and field of application

This International Standard specifies a method of performance tests and technical conditions for the supply of pneumatic tools and gives detailed instruction on the measurement of power output and air consumption and means of adjusting the measured values to specified conditions.

2 References

- ISO 31, *Quantities, units and symbol*.
- ISO 1000, *SI units and recommendations for the use of their multiples and of certain other units*.
- ISO 1180, *Shanks for pneumatic tools and fitting dimensions of chuck bushings*¹⁾.
- ISO 2944, *Fluid power systems and component — Nominal pressures*.
- ISO 3857-1, *Compressors, pneumatic tools and machines — Vocabulary — Part 1: General*.
- ISO 3857-3, *Compressors, pneumatic tools and machines — Vocabulary — Part 3: Pneumatic tool and machines*.
- ISO 5167, *Measurement of fluid flow by means of orifice plates, nozzles and Venturi tubes inserted in circular cross-section conduits running full*.
- ISO 5391, *Compressors, pneumatic tools and machines — Classification*²⁾.
- ISO 5393, *Rotary pneumatic tools for threaded fasteners — Performance test*.
- ISO 6544, *Hand-held pneumatic assembly tools for installing threaded fasteners — Reaction torque and torque impulse measurements*.

¹⁾ At present at the stage of draft. (Revision of ISO/R 1180:1970.)

²⁾ At present at the stage of draft.

3 Definitions

3.1 Definitions of some general physical terms

3.1.1

total pressure

the pressure measured on the stagnation point when a moving gas stream is brought to rest and its kinetic energy is converted by an isentropic compression from the flow condition to the stagnation condition. It is the pressure usually measured by a Pitot tube. In a stationary body of gas the static and the total pressures are numerically equal

3.1.2

static pressure

the pressure measured in a gas in such a manner that no effect on measurement is produced by the gas velocity

3.1.3

dynamic (velocity) pressure

the total pressure minus the static pressure

3.1.4

atmospheric pressure

the absolute pressure of the atmosphere measured at the test place

3.1.5

gauge (effective) pressure

the pressure measured above the atmospheric pressure

3.1.6

absolute pressure

the pressure measured from absolute zero, i.e. from an absolute vacuum. It equals the algebraic sum of atmospheric pressure and gauge pressure

3.1.7

free air

air at the atmospheric conditions of the site

3.1.8

total temperature

the temperature which would be measured at the stagnation point if a gas stream were brought to rest and its kinetic energy converted by an isentropic compression from the flow condition to the stagnation condition

the temperature rise at stagnation of the gas stream can be neglected if the gas velocity around the measuring point is lower than 30 m/s

3.2 Definitions concerning rotary air motor torque performance

3.2.1 static starting torque

the torque that continues to be developed by the motor in response to an application of fluid pressure when the torque load is sufficient to prevent rotation

NOTE The value may depend upon the angular position of the motor shaft. The maximum static starting torque is the value obtained when the angular position of the motor shaft is in the most advantageous location. The minimum static starting torque is the value obtained when the angular position of the motor shaft is in the least advantageous location.

3.2.2 dynamic starting torque

the peak torque delivered by the output shaft of the motor in response to an application of fluid pressure when the torque load is sufficient to prevent rotation

NOTE The dynamic starting torque will often be in excess of the static starting torque where lost motion exists between the motor shaft and the load, allowing rotation and momentum to develop prior to application of the load.

3.2.3 brake loaded torque

the continuous torque delivered at a constant speed

3.2.4 maximum brake loaded torque

the maximum continuous torque that can be delivered at a constant speed

3.2.5 static stall torque

the torque that continues to be developed after a load has stalled the motor

NOTE The value may depend upon the angular position of the motor shaft in the stalled position. The maximum static stall torque is the value obtained when the angular position of the motor shaft is in the most advantageous location. The minimum static stall torque is the value obtained when the angular position of the motor shaft is in the least advantageous location.

3.2.6 dynamic stall torque

the peak torque delivered by the output shaft when a load is applied that stalls the motor

NOTE The peak torque will vary, depending upon the rate of deceleration caused by the load.

4 Symbols and units

These are in accordance with ISO 31 and ISO 1000.

4.1 General rules for letter symbols

The use of the letter symbols given in 4.2 and 4.3 is recommended. The list is formulated in line with the following seven principles:

- a) the same symbols shall be used for the same quantities regardless of the system of units;
- b) for any one quantity a single symbol shall be used with subscripts to indicate readings other than the primary one;
- c) the same symbols shall be used for a given concept regardless of the number of special values which occur;
- d) letter subscripts shall be used to denote values under special conditions;
- e) numerical subscripts shall be used to denote values at different points of a cycle;
- f) symbols shall be confined if possible to roman letters;
- g) where possible, capital letters shall be used for absolute quantities.

4.2 Letter symbols and units

Symbol	Quantity	Unit
<i>D</i>	Piston diameter	mm
<i>d</i>	Pipe or hose internal diameter	mm
<i>e</i>	Impact	J
<i>F</i>	Force	N
<i>L</i>	Length	m or mm
<i>M</i>	Torque	Nm
<i>m</i>	Mass	kg
<i>P</i>	Power	kW
<i>N</i>	Number of tools	—
<i>n</i>	Shaft speed	min ⁻¹
<i>f</i>	Blow rate	Hz
<i>p</i>	Absolute pressure	bar ^a
<i>p_e</i>	Gauge pressure (effective pressure) — <i>p_e</i> = <i>p</i> - <i>p_b</i>	bar
<i>p_b</i>	Atmospheric pressure	bar
<i>q_v</i>	Volume flow rate	l/s
<i>s</i>	Standard deviation	—
<i>S</i>	Stroke	mm

^a 1 bar = 10⁵ Pa.