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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

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UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



DRAFT International Standard

ISO/DIS 17104

Rotary tools for threaded fasteners – Impulse and impulsing tools – Performance test method

ICS: 25.140.10; 23.140

ISO/TC 118/SC 3

Secretariat: **SIS**

Voting begins on:
2024-06-17

Voting terminates on:
2024-09-09

This document is circulated as received from the committee secretariat.

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 118, *Compressors and pneumatic tools, machines and equipment*, Subcommittee SC 3, *Pneumatic tools and machines*.

This second edition cancels and replaces the first edition ISO/TS 17104:2006, which has been technically revised and upgraded to an international standard.

The main changes compared to the previous edition are as follows:

- The title and scope have been modified to reflect changes in the tool types that have become available since 2006.
- Starting point of the joint rate measurement is taken from 50 % of the target rather than 10 %.
- Several requirements are explained more fully to increase user understanding and tool test consistency.
- The opportunity for manufacturers and users to test performance over a defined number of cycles is added.
- New annexes have been added to educate users in the background to the requirements.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The test method specified in this document is designed to measure the performance of power assembly tools in a laboratory environment. It is not intended as a routine in-plant inspection test.

This document is intended to:

- enable the manufacturers of power tools to offer their products under standardized technical specifications;
- give users of threaded fasteners a method for evaluating and specifying the performance of power assembly tools.

As with the first version, this document remains a fundamental test procedure, with no attempt to set acceptance criteria. Any minimum performance requirements are the responsibility of the user to meet the demands of the particular application for which the tool is intended for use.

Differently from the first version, this document is applicable to tightening tools of any power source within its scope.

Additional elements have been introduced with this version to address tool performance over a defined number of operating cycles and reference to inbuilt indication or control systems that now exist in a number of tools.

[Annex A](#) explains the basis for the use of clamp force rather than torque for testing the performance of fastener assembly tools that apply torque in a discontinuous

[Annex B](#) explains the principle of electric pulsing tools which operate in a different way to hydraulic impulse tools.

[Annex C](#) includes preferred torque values that may be used for testing.

[Annex D](#) gives an example format for the test report.

This version includes some changes to the specifications for the test joints and for the test method. These changes reflect the practical experience gained through the use of the previous version of the document and are intended to improve the reproducibility of the test method.

Testing of the tools within the scope of this document present a number of challenges. New equipment and methods are being developed and the sub-committee members responsible for its publication believe that this document is a step closer to understanding the true performance of impulse and impulsing tools. Further development will continue and the experiences of users are welcomed by the sub-committee.

Results obtained using this version may differ from results obtained using the previous version.

Some of the changes in this document have been guided by the work of the VDI/VDE Committee Gesellschaft Mess- und Automatisierungstechnik and are used with their permission.

Rotary tools for threaded fasteners – Impulse and impulsing tools – Performance test method

1 Scope

This document specifies a laboratory performance test method for power assembly tools (referred throughout the document as “tools”) for installing threaded fasteners.

It provides a method for the measurement of torque repeatability (scatter)

- over a range of torque rates as specified in this document;
- over a range of torque adjustment as defined by the manufacturer;
- over a number of operating cycles as defined by the manufacturer.

It gives instructions on equipment parameters, what to test for and how to evaluate and present the test data.

It is applicable to tools

- of any power source, such as pneumatic or electric, including battery-powered,
- which apply torque in discontinuous increments,
- within the torque range 0,5 N·m to 800 N·m. Outside this range, it is acceptable to modify the test method providing that the modification is documented in the test report.

It is not applicable to:

- impact wrenches;
- ratchet wrenches or wrenches with ratcheting clutches.

The relationship between torque measurements and tension-based tests is commented on in Informative [Annex A](#).

The use of tools using discontinuous operation of the motor to provide torque impulses is discussed in Informative [Annex B](#).

It requires manufacturers to perform tests over their defined torque range of the tool; however, it allows users to perform single point tests in order to minimize the number of test joints necessary for a wide range of test torque levels. A list of preferred test torque levels is provided in informative [Annex C](#).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 463, *Geometrical Product Specifications (GPS) — Dimensional measuring equipment — Design and metrological characteristics of mechanical dial gauges*

3 Terms, definitions and symbols

For the purposes of this document, the following terms and definitions apply. Symbols are shown where they are used in this document.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

rotary tool for threaded fasteners

powered tool, the output spindle of which rotates to turn a threaded fastener

Note 1 to entry: Either a pneumatic or an electric motors can be used.

Note 2 to entry: The final movement of the spindle can be rotational and continuous or rotational and discontinuous, depending on the type of rotary machine considered.

3.1.1

continuous rotation fastening tool

powered assembly tool for tightening threaded fasteners, which applies torque to a fastener in a continuous motion

Note 1 to entry: Used in this document when establishing the relationship between torque and clamp force

3.1.2

hydraulic impulse tool

powered assembly tool for tightening threaded fasteners, which applies torque to a fastener in discontinuous increments through a hydraulic impulse unit between the motor and the output drive

3.1.3

electric pulsing tool

powered assembly tool for tightening threaded fasteners, which applies torque to a fastener in discontinuous increments by pulsing the input to the electric motor which then delivers pulses of kinetic energy to the output drive

Note 1 to entry: A number of variations on this tool exist. Their common distinguishing action is that the pulsing comes from controlling the motor, rather than subsequently controlling the output of the motor.

3.1.4

automatic shut-off tool

powered assembly tool for tightening threaded fasteners, provided with a torque control mechanism which shuts off or disconnects the power to the tool when the predetermined set output torque level is attained

Note 1 to entry: A number of variations on the mechanisms for achieving this feature exist.

3.1.5

non-shut-off tool

powered assembly tool for tightening threaded fasteners, which delivers an output torque as long as power is applied to the motor

3.1.6

pulse mode

settings employed in an *electric pulsing tool* (3.1.3) to establish pulse frequency, duration and intensity

Note 1 to entry: The settings will influence the reaction force experienced by the operator

3.1.7

number of pulses

number of pulses generated by the tool from the start of rundown to completion of the defined joint

Note 1 to entry: For shut-off tools it is the number of impulses generated before shut-off. For non-shut-off tools it is the number of pulses until the fastener stops rotating.

3.1.8

operating cycle

one complete fastener rundown including pause for cooling of the tool

3.1.9

joint condition

combination of *torque rate* (3.4.1) and *test torque* (3.8)

Note 1 to entry: The effect of lubrication viscosity, thread deformation or galling etc. can alter the joint condition.

3.2

standard deviation

s

positive square root of the variance

Note 1 to entry: In general, the standard deviation of the population of a random variable X is estimated by the positive square root of an estimate of the variance of the population of X .

[SOURCE: ISO/IEC Guide 98-3: 2008, C.2.12]

3.2.1

six sigma

$6s$

range of probability, plus and minus three *standard deviations* (3.2) from the mean, derived from a sample of a statistical population

Note 1 to entry: For a normally distributed statistical population, 99,73 % of all members of that population are encompassed.

3.3

diameter

D

nominal diameter of a bolt

Note 1 to entry: The diameter is expressed in millimetres.

3.4

angle

$\emptyset$

measure of the rotation through which a fastener is turned

Note 1 to entry: The angle is expressed in degrees.

3.4.1

torque rate

rate of increase of torque relative to rotation while tightening a fastener in a threaded joint.

Note 1 to entry: The torque rate is expressed in newton-metres per revolution.

3.4.2

rundown

period of angular rotation without corresponding torque increase

Note 1 to entry: This allows the tool to reach operating speed.

3.5 clamp force

F_C

axial tension acting on the bolt shank or compression acting on the clamped member

Note 1 to entry: The clamp force is expressed in Newton.

3.5.1 peak clamp force

F_{CP}

peak value of the *clamp force* (3.5) measured during a tightening cycle

Note 1 to entry: The peak clamp force is expressed in Newton.

3.5.2 target clamp force

F_{CT}

clamp force (3.5) required to achieve the test torque when testing a tool on a test joint

Note 1 to entry: This is based on [Formula \(1\)](#):

$$F_{CT} = T_T / (\bar{K} \times D) \quad (1)$$

where T_T is defined in [3.8](#), $\bar{K}$ is defined in [3.9.1](#), and D is defined in [3.3](#).

3.6 torque

T

product of the force turning the fastener and the perpendicular distance between the line of force and the centre of the fastener

Note 1 to entry: Torque is expressed in Newton-metre.

3.6.1 dynamic torque

T_D

torque (3.6) recorded during the determination of K for a test joint condition as described in [4.3.2](#)

Note 1 to entry: For test joint analysis, dynamic torque is measured with an in-line, rotary torque and angle transducer, placed between a continuous drive spindle and the socket/driver bit.

Note 2 to entry: Dynamic torque is expressed in Newton-metre.

3.6.2 peak dynamic torque

T_{DP}

peak value of the dynamic *torque* (3.6.1) recorded during a tightening cycle performed during the procedure described in [4.3.1](#)

3.7 correlated torque

T_C

torque (3.6) derived from a *peak clamp force* (3.5.1) measurement

Note 1 to entry: This is based on [Formula \(2\)](#):

$$T_C = K \times D \times F_{CP} \quad (2)$$

where K is defined in [3.9](#), F_{CP} is defined in [3.5.1](#) and d is defined in [3.3](#).

Note 2 to entry: The correlated torque is expressed in Newton-metre.