
**Hand-held non-electric power tools —
Safety requirements —**

Part 6:
**Assembly power tools for threaded
fasteners**

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*Machines portatives à moteur non électrique — Exigences de
sécurité —
Partie 6: Machines d'assemblage pour éléments de fixation filetés*

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Published in Switzerland

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 11148-6 was prepared by Technical Committee ISO/TC 118, *Compressors and pneumatic tools, machines and equipment*, Subcommittee SC 3, *Pneumatic tools and machines*.

ISO 11148 consists of the following parts, under the general title *Hand-held non-electric power tools — Safety requirements*:

- *Part 1: Assembly power tools for non-threaded mechanical fasteners*
- *Part 2: Cutting-off and crimping power tools*
- *Part 3: Drills and tappers*
- *Part 4: Non-rotary percussive power tools*
- *Part 5: Rotary percussive drills*
- *Part 6: Assembly power tools for threaded fasteners*
- *Part 7: Grinders*
- *Part 8: Sanders and polishers*
- *Part 9: Die grinders*
- *Part 10: Compression power tools*
- *Part 11: Nibblers and shears*
- *Part 12: Circular, oscillating and reciprocating saws*

A part 13, dealing with fastener driving tools, is under preparation.

Introduction

This document is a type C standard as stated in ISO 12100.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are defined in the Scope of this part of ISO 11148.

When provisions of this type C standard are different from those that are stated in type A or B standards, the requirements of this type C standard take precedence over the requirements of other standards for machines that have been designed and built according to the requirements of this type C standard.

ISO 11148 consists of a number of independent parts for individual types of hand-held, non-electric power tools.

Certain elements of this part of ISO 11148 cover hand-held, non-electric power tools driven by internal combustion engines powered by gaseous or liquid fuel. In these parts, the safety aspects relating to internal combustion engines are found in a normative annex.

The parts are type C standards and refer to pertinent standards of types A and B where such standards are applicable.

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Hand-held non-electric power tools — Safety requirements —

Part 6: Assembly power tools for threaded fasteners

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1 Scope

This part of ISO 11148 applies to hand-held non-electric power tools (hereafter referred to as “assembly power tools for threaded fasteners”) intended for tightening or installing of threaded fasteners. The assembly power tools for threaded fasteners can be powered by compressed air, hydraulic fluid or internal combustion engines and are intended for use by one operator and supported by the operator's hand or hands, with or without a suspension, e.g. a balance.

This part of ISO 11148 covers

- air-hydraulic impulse wrenches; [ISO 11148-6:2010](https://standards.iteh.ai/catalog/standards/sist/d5d4404e-02bc-4d57-803d-9f0911e1e644/iso-11148-6-2010)
- impact wrenches; <https://standards.iteh.ai/catalog/standards/sist/d5d4404e-02bc-4d57-803d-9f0911e1e644/iso-11148-6-2010>
- fastener installation tools;
- nutrunners;
- open-ended spanners (crow-foot with open-ended socket or tube nut wrench);
- ratchet wrenches;
- screwdrivers.

NOTE 1 For examples of assembly power tools for threaded fasteners, see Annex B.

This part of ISO 11148 does not cover special requirements and modifications of assembly power tools for threaded fasteners for the purpose of mounting them in fixtures.

This part of ISO 11148 deals with all significant hazards, hazardous situations or hazardous events when the tools are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer, with the exception of the use of assembly power tools for threaded fasteners in potentially explosive atmospheres.

NOTE 2 EN 13463-1 gives requirements for non-electrical equipment for potentially explosive atmospheres.

2 Normative references

The following referenced documents are indispensable for the application 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 3857-3, *Compressors, pneumatic tools and machines — Vocabulary — Part 3: Pneumatic tools and machines*

ISO 3864-2, *Graphical symbols — Safety colours and safety signs — Part 2: Design principles for product safety labels*

ISO 4871, *Acoustics — Declaration and verification of noise emission values of machinery and equipment*

ISO 5391, *Pneumatic tools and machines — Vocabulary*

ISO 7000, *Graphical symbols for use on equipment — Index and synopsis*

ISO 9158, *Road vehicles — Nozzle spouts for unleaded gasoline*

ISO 9159, *Road vehicles — Nozzle spouts for leaded gasoline and diesel fuel*

ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

ISO 13732-1, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces*

ISO 13732-3, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 3: Cold surfaces*

ISO 15744, *Hand-held non-electric power tools — Noise measurement code — Engineering method (grade 2)*

ISO 17066, *Hydraulic tools — Vocabulary*

ISO 20643, *Mechanical vibration — Hand-held and hand-guided machinery — Principles for evaluation of vibration emission*

ISO 28927-2, *Hand-held portable power tools — Test methods for evaluation of vibration emission — Part 2: Wrenches, nutrunners and screwdrivers*

EN 12096, *Mechanical vibration — Declaration and verification of vibration emission values*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100, ISO 3857-3, ISO 5391 and ISO 17066 (for hydraulic tools), and the following apply.

3.1 General definitions

3.1.1

hand-held power tool

machine operated by one or two hands and driven by rotary or linear motors powered by compressed air, hydraulic fluid, gaseous or liquid fuel, electricity or stored energy (e.g. by a spring) to do mechanical work and so designed that the motor and the mechanism form an assembly that can easily be brought to its place of operation

NOTE Hand-held power tools driven by compressed air or gas are called pneumatic tools (or air tools). Hand-held power tools driven by hydraulic liquid are called hydraulic tools.

3.1.2**inserted tool**

tool inserted in the assembly power tool for threaded fasteners to perform the intended work

3.1.3**service tool**

tool intended for performing maintenance or service on the assembly power tool for threaded fasteners

3.1.4**control device**

device to start and stop the assembly power tool for threaded fasteners or to change the direction of the rotation or to control the functional characteristics such as speed and power

3.1.5**start-and-stop device****throttle**

manually operated control on the assembly power tool for threaded fasteners by which the energy supply to the motor can be turned on and off

3.1.6**hold-to-run start-and-stop device****constant-pressure throttle**

start-and-stop device that automatically returns to the OFF position when force on the start-and-stop device actuator is released

3.1.7**lock-on start-and-stop device****constant-pressure throttle with instant release lock**

hold-to-run start-and-stop device that can be locked in the ON position and designed so that it permits the assembly power tool for threaded fasteners to be turned off by a single motion of the same finger or fingers used to turn it on

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3.1.8**lock-off start-and-stop device****lock-off throttle**

start-and-stop device that automatically latches in the OFF position when the actuator is released and where two motions are required to energize the assembly power tool for threaded fasteners

3.1.9**positive on-off start-and-stop device****positive on-off throttle**

start-and-stop device that remains in an ON position until it is manually changed

3.1.10**maximum operating pressure**

maximum pressure at which an assembly power tool for threaded fasteners may be operated

3.1.11**whip hose**

air hose, connecting the main air hose with an air tool for the purpose of providing more flexibility

3.1.12**rated air pressure**

air pressure, required at an air tool inlet port to assure rated performance of the tool, also considered the maximum pressure at which the tool may be operated

3.1.13 Rated speed

3.1.13.1

rated speed

⟨pneumatic tool⟩ speed of an air tool at no load and rated air pressure at the tool inlet port

NOTE The rated speed is expressed in revolutions per minute.

3.1.13.2

rated speed

⟨hydraulic tool⟩ nominal speed of a hydraulic tool at no load and rated flow at the tool inlet port

NOTE The rated speed is expressed in revolutions per minute.

3.1.14

maximum attainable speed

maximum speed which the tool can achieve under the most adverse condition of possible maladjustment or malfunction of its speed control devices, when supplied with compressed air at the pressure marked on the assembly power tool for threaded fasteners

3.1.15

suspension device

device, which is attached to the tool, whose primary purpose is to reduce the strain on the operator caused by the weight of the tool

NOTE The device may also have a secondary purpose of transmitting a reaction torque.

3.2 Definitions related to assembly power tools for threaded fasteners

3.2.1

screwdriver

rotary, reversible or non-reversible, power tool driving a spindle fitted with a screwdriver bit

NOTE Screwdrivers can be straight, pistol-grip or angle types, and might or might not have a clutch; these terms are defined in ISO 5391.

3.2.2

nutrunner

rotary, reversible or non-reversible, power tool, incorporating a socket adapter for the tightening of nuts and bolts

NOTE Nutrunners can be pistol-grip or angle drive types, and might or might not have a clutch. This category includes two-speed and crow-foot nutrunners; these terms are defined in ISO 5391.

3.2.3

impact wrench

percussive rotary power tool fitted with a multi-vane or oscillating motor driving a hammer that periodically strikes an anvil to tighten nuts and bolts without producing any considerable reaction torque on the tool

NOTE These terms are defined in ISO 5391.

3.2.4

air-hydraulic impulse wrench

power assembly tool fitted with a motor driving a hydraulic impulse mechanism for tightening threaded fasteners, which applies torque through a hydraulic impulse unit to a fastener in discontinuous increments

NOTE Air-hydraulic impulse wrenches have the same types as impact wrenches; these terms are defined in ISO 5391.

3.2.5**fastener installation tool**

screwdriver, having a manual or automatic reverse mechanism and a threaded drive spindle for installing threaded captive fasteners, which may be straight, pistol-grip or angle drive type

3.2.6**open-ended spanner****crow-foot with open-ended socket****tube nut wrench**

nutrunner or a ratchet wrench with an open-ended socket

3.2.7**ratchet wrench**

angle-drive wrench progressively rotating a socket by means of a ratchet and pawl coupling

3.2.8**reaction bar**

implement fitted to the hand-held tool to place against a fixed structure of sufficient strength to accept the load of the reaction torque

3.2.9**sleeve fitting**

device for aligning the inserted tool or drive adapter with the axis of rotation of the power tool spindle that can reduce the vibration caused by misalignment

3.2.10**drive adapter**

implement fitted to the hand-held power tool to drive the threaded fastener

EXAMPLE Drive bits and sockets.

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4 Safety requirements and/or protective measures**4.1 General**

The machine shall comply with the following safety requirements and/or protective measures and be verified in accordance with Clause 5. In addition, the machine shall be designed in accordance with the principles of ISO 12100 for the relevant, but not necessarily significant, hazards, which are dealt with by this part of ISO 11148.

The measures adopted to comply with the requirements of Clause 4 shall take account of the state-of-the-art.

It is recognized that optimizing the design with respect to some safety measures can result in a degradation of performance against other safety requirements. In such cases, it is required to strike a balance between the various requirements in order to achieve an assembly power tool design that satisfies each requirement, so far as is reasonably practicable, and remains fit for purpose.

4.2 Mechanical safety**4.2.1 Surfaces, edges and corners**

Accessible parts of assembly power tools for threaded fasteners, except the inserted tool, shall not have sharp edges or angles or rough or abrasive surfaces; see ISO 12100:2010, 6.2.2.1.

4.2.2 Supporting surface and stability

Assembly power tools for threaded fasteners shall be so designed that they can be laid aside and remain in a stable position on a plane surface.

4.2.3 Hydraulic fluid ejection

Hydraulic systems of the assembly power tool shall be enclosed so as to give protection against high-pressure fluid ejection.

4.2.4 Guards

Guards covering the drive adaptor and the inserted tool are not required.

4.2.5 Access openings

Openings provided in the assembly power tool for threaded fasteners to allow access to adjusting means shall be designed to protect the operator from pinching his/her fingers while operating the tool; see ISO 13857.

4.2.6 Socket retainer

The socket retainer shall be designed and used so that it retains the socket on the output shaft while the assembly power tool for threaded fasteners is operating. Loose pin retainers shall have a positive means of retaining the pin.

4.2.7 Power tool construction

The assembly power tool for threaded fasteners shall be designed and constructed so as to prevent the loosening or loss of components during expected use, including rough handling and occasional dropping, which can compromise its safety functions. Verification shall be made in accordance with 5.5.

4.3 Thermal safety

Surface temperatures of parts of the assembly power tools for threaded fasteners that are held during use or that can be inadvertently touched shall follow the provisions of ISO 13732-1 and ISO 13732-3.

Pneumatic tools shall be designed to avoid the cooling effects of exhaust air on the handles and other gripping zones.

4.4 Noise

The assembly power tool for threaded fasteners shall be designed and constructed so that the emission of noise is reduced to the lowest level, taking account of technical progress and the availability of means of reducing noise, in particular at the source. Principles for designing assembly power tools for threaded fasteners with reduced noise emission are contained in ISO/TR 11688-1 and ISO/TR 11688-2.

The noise emission from using assembly power tools for threaded fasteners has three main sources:

- the assembly power tool for threaded fasteners itself;
- the inserted tool;
- the workpiece.

NOTE 1 Generally, the noise emitted due to the characteristics of the workpiece cannot be controlled directly by the manufacturer of the assembly power tool for threaded fasteners.

Typical sources of noise emitted by the assembly power tool for threaded fasteners itself are

- a) the motor and drive mechanism;
- b) the exhaust air or gases;
- c) vibration- or impact-induced noise.

Where the exhaust air or gases are the major contributor to the noise, means to reduce the noise, for example a silencer or equivalent means, shall be included in the design.

NOTE 2 Alternatively, where practicable, the exhaust air or gases can be piped away from the operator in a hose.

Vibration-induced noise can often be reduced by vibration isolation and damping.

This list is not exhaustive; where alternative technical measures for noise reduction, with greater efficiency, are available, they should be used by the manufacturer.

4.5 Vibration

The assembly power tool for threaded fasteners shall be designed and constructed so that the vibration is reduced to the lowest level at the handles and at any other parts of the tool in contact with the operator's hands, taking account of technical progress and the availability of means of reducing vibration, in particular at source. Principles for designing assembly power tools for threaded fasteners with reduced vibration emission are contained in CR 1030-1.

Typical sources of vibration emitted by an assembly power tool for threaded fasteners are

- unbalance of rotating parts;
- poorly designed motors and gears;
- resonances in the structure of the machine, particularly the handles and their mounts.

The following design features have been found effective and should be considered by manufacturers when designing assembly power tools for threaded fasteners:

- a) autobalancers; [ISO 11148-6:2010](https://standards.iteh.ai/catalog/standards/sist/d5d4404e-02bc-4d57-803d-9f0911e1e644/iso-11148-6-2010)
- b) increasing inertia; <https://standards.iteh.ai/catalog/standards/sist/d5d4404e-02bc-4d57-803d-9f0911e1e644/iso-11148-6-2010>
- c) isolated casing or handles;
- d) in the case of impulse wrenches, the socket interface should be dimensioned as recommended by ISO/TS 21108.

This list is not exhaustive; where alternative technical measures for vibration reduction, with greater efficiency, are available, they should be used by the manufacturer.

4.6 Materials and substances processed, used or exhausted

4.6.1 Exhaust air or gas

Assembly power tools for threaded fasteners driven with compressed air or gas or an internal combustion engine shall be designed in such a way that exhaust air or gases are directed so as not to cause a hazard to the operator and so that any other effects, such as blowing the dust and reflected air or gas from the workpiece onto the operator, are minimized.

4.6.2 Lubricants

When specifying lubricants, the manufacturer shall take environmental and occupational health aspects into account.