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

Part 4: Non-rotary percussive power tools

Machines portatives à moteur non électrique — Exigences de sécurité —

Partie 4: Machines portatives non rotatives à percussion

Reference number
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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 11148-4 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 11148-4:2010), of which it constitutes a minor revision.

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.

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

Part 4: Non-rotary percussive power tools

IMPORTANT — The electronic file of this document contains colours that are considered useful for the correct understanding of the document. Users should consider printing this document using a colour printer. ISO 3864-4 provides colorimetric and photometric properties together with, as a guideline, references from colour order systems.

1 Scope

This part of ISO 11148 applies to hand-held non-electric power tools (hereinafter “non-rotary percussive power tools”) intended for chipping, riveting, breaking of concrete and asphalt, ramming, etc. The non-rotary percussive power tool can be powered by compressed air, hydraulic fluid or internal combustion engines and is intended for use by one operator and supported by the operator’s hand or hands, with or without a suspension, e.g. a balancer.

This part of ISO 11148 covers

— breakers;

— bush hammers;

— chipping hammers;

— small chisels;

— engraving pens;

— needle scalers;

— pick hammers;

— pile drivers;

— portable pile drivers;

— punches;

— rammers;

— riveting hammers;

— scaling hammers;

— stone hammers;

— spades;

— tampers.

NOTE 1 For examples of non-rotary percussive power tools, see Annex B.

This part of ISO 11148 does not cover special requirements and modifications on non-rotary percussive power tools for the purpose of mounting in a fixture.

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 non-rotary percussive power tools in potentially explosive atmospheres.

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

2 Normative references

The following documents, in whole or in part, are normatively referenced this document and are indispensable for its application. 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 5391, *Pneumatic tools and machines — Vocabulary*

ISO 7000, *Graphical symbols for use on equipment — Registered symbols*[1)]

ISO 7010, *Graphical symbols — Safety colours and safety signs — Registered safety signs*[1)]

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 28927-6, *Hand-held portable power tools — Test methods for evaluation of vibration emission — Part 6: Rammers*

ISO 28927-9, *Hand-held portable power tools — Test methods for evaluation of vibration emission — Part 9: Scaling hammers and needle scalers*

ISO 28927-10, *Hand-held portable power tools — Test methods for evaluation of vibration emission — Part 10: Percussive drills, hammers and breakers*

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 3857-3, ISO 5391, ISO 12100 and ISO 17066 (for hydraulic tools), and the following apply.

1) The graphical symbol collections of ISO 7000, ISO 7001 and ISO 7010 are also available online in the ISO web store. For more information, consult http://www.iso.org/iso/fr/publications_and_e-products/databases.htm.

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 non-rotary percussive power tool to perform the intended work

3.1.3
service tool
tool intended for performing maintenance or service on the non-rotary percussive power tool

3.1.4
control device
device to start and stop the non-rotary percussive power tool 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 non-rotary percussive power tool 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 non-rotary percussive power tool to be turned off by a single motion of the same finger or fingers used to turn it on

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 non-rotary percussive power tool

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 a non-rotary percussive power tool 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 non-rotary percussive power tool

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 non-rotary percussive power tools

3.2.1
non-rotary percussive power tool
power tool that delivers a series of percussive blows without rotary action of the inserted tool

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 not 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 a drill or tapper 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 non-rotary percussive power tools, 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

The non-rotary percussive power tool shall be designed such that it can be laid aside and remain in a stable position on a plane surface.

4.2.3 Ejection of parts

Integral with or installed on a non-rotary percussive power tool shall be a retainer, without which the inserted tool has the possibility of being ejected when it is operated off a work surface.

4.2.4 Hydraulic fluid ejection

Hydraulic systems of the non-rotary percussive power tools shall be enclosed so as to give protection against high-pressure fluid ejection.

4.2.5 Guards

Guards covering the inserted tool are not required.

4.2.6 Power tool construction

The non-rotary percussive power tool shall be so designed and constructed as to prevent the loosening or loss of components during expected use, including rough handling and occasional dropping, which can compromise its safety functions.

4.3 Thermal safety

Surface temperatures of parts of the non-rotary percussive power tools 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 reduction

The non-rotary percussive power tool 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 source. Principles for designing non-rotary percussive power tools with reduced noise emission are contained in ISO/TR 11688-1 and ISO/TR 11688-2.

The noise emission from using non-rotary percussive power tools has three main sources:

— the non-rotary percussive power tool itself;

— the inserted tool;

— the workpiece.

NOTE Generally, the noise emitted due to the characteristics of the workpiece cannot be controlled directly by the manufacturer of the non-rotary percussive power tool.

Typical sources of noise emitted by the non-rotary percussive power tool 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.

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 non-rotary percussive power tool 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 the source. Principles for designing non-rotary percussive power tools with reduced vibration emission are contained in CR 1030-1.

Typical sources of vibration emitted by a non-rotary percussive power tool are

— impacts,

— poorly designed motors, and

— 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 non-rotary percussive power tools:

a) reaction masses and springs;

b) increasing inertia;

c) isolated casing or handles.

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

Non-rotary percussive power tools 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 Dust and fumes

So far as is reasonably practicable, the non-rotary percussive power tool shall be designed to facilitate the collection and removal or suppression of airborne dust particles and fumes generated by the work process. The user instructions shall include sufficient information to enable adequate control of the risks from dust and fumes.

4.6.3 Lubricants

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

4.7 Ergonomics and design of the handle

The gripping areas of the non-rotary percussive power tools shall be designed to provide a convenient, effective means for the operator to exercise full control over the non-rotary percussive power tool.

Handles and other parts used for gripping the non-rotary percussive power tool shall be designed to ensure that the operator is able to grip the non-rotary percussive power tool correctly and to perform the expected work. Handles shall suit the functional anatomy of the hand and the dimensions of the hands of the operator population.

NOTE Further guidance on ergonomic design principles can be found in EN 614-1.

Non-rotary percussive power tools having a mass greater than 2 kg (including the inserted tool) shall be capable of being supported by two hands while being lifted or operated.

The grip shall be such that normal feed force can be transmitted in an ergonomic way from the hand of the operator to the non-rotary percussive power tool.

4.8 Controls

4.8.1 Start-and-stop device

Non-rotary percussive power tools shall be equipped with a single control device to start and/or stop them. It shall be adapted to the handle, or to the part of the non-rotary percussive power tool being gripped, so that it can be held comfortably in the run position, and so that the operator can activate it without releasing the grip on the handles.

Start-and-stop-devices shall be so designed that the inserted tool ceases to be powered when the start-and-stop device is released. Without manual effort and when completely released, the device shall move to the stop position, i.e. shall be of the hold-to-run type.

Start-and-stop devices shall be in the stop position or immediately move to the stop position when the assembly non-rotary percussive power tool for threaded fasteners is connected to the energy supply.

It shall not be possible to lock the start-and-stop device in the running position.

There are two exceptions.

a) A small engraving tool may be equipped with a positive on-off throttle.

b) A scaler whose chisel is integral with or fixed to the piston such that the piston-chisel cannot be expelled may be equipped with a positive on-off throttle.

4.8.2 Unintentional start

The start-and-stop device shall be designed, positioned or guarded such that the risk of unintentional start is minimized. Verification shall be made in accordance with 5.4.

4.8.3 Actuating forces

For non-rotary percussive power tools that are intended for frequent starts or for use with precision work, the actuating force shall be small.

For non-rotary percussive power tools that are normally used in operations of long duration, the force to keep the start device in the run position should be small.

NOTE For further information on trigger forces for control devices, see EN 894-3.

5 Verification

5.1 General conditions for tests

Tests according to this part of ISO 11148 are type tests.

5.2 Noise

The noise-emission values shall be measured and declared in accordance with ISO 15744.

Compliance with 4.4 may be verified through a comparison of the noise emission values with those for other machines of the same family, or with machines of similar size and performance characteristics.

5.3 Vibration

The vibration total value for non-rotary percussive power tools shall be measured and reported in accordance with ISO 28927-6 for rammers, ISO 28927-9 for hammers and breakers or ISO 28927-10 for scaling hammers and needle scalers.

The vibration-emission value and its uncertainty shall be declared in accordance with EN 12096.

Compliance with 4.5 may be verified through a comparison of the vibration-emission values with those for other machines of the same family, or with machines of similar size and performance characteristics.

5.4 Unintentional start

Compliance with 4.8.2 shall be verified for non-rotary percussive power tools up to 15 kg as follows.

The retainer shall be mounted and not removed.

The non-rotary percussive power tool shall be connected to the energy supply and placed and maintained in any possible position and pulled over a horizontal plane by its hose.

Operation of the start-and-stop device shall not occur.

5.5 Power tool construction

Except for breakers, compliance with 4.2.6 shall be verified by dropping a sample non-rotary percussive power tool three times onto a concrete surface from a height of 1 m without affecting its operational and safety functions. The sample shall be positioned to vary the point of impact.

5.6 Structure of verification of safety requirements

Table 1 — Structure of verification

Safety requirement	Visual check	Functional check	Measurement	Reference [to subclause(s) of this part of ISO 11148 or to other standards]
4.2.1 Surfaces, edges and corners	X	—	—	—
4.2.2 Supporting surface and stability	X	X	—	—
4.2.3 Ejection of parts	X	—	—	—
4.2.4 Hydraulic fluid ejection	X	—	—	—
4.2.6 Power tool construction	—	X	—	5.5
4.3 Thermal safety	—	X	X	ISO 13732-1 ISO 13732-3
4.4 Noise reduction	—	—	X	ISO 15744 5.2
4.5 Vibration	—	—	X	ISO 28927-6 ISO 28927-9 ISO 28927-10 5.3
4.6.1 Exhaust air or gas	—	X	—	—
4.6.2 Dust and fumes	X	X	—	—
4.7 Ergonomics and design of the handle	X	—	—	—
4.8.1 Start-and-stop device	—	X	—	—
4.8.2 Unintentional start	X	X	—	5.4
4.8.3 Actuating forces	X	X	—	—

6 Information for use

6.1 Marking, signs and written warnings

Non-rotary percussive power tools shall be marked visibly, legibly and indelibly with the following information:

— name and full address of the manufacturer and, where applicable, his/her authorized representative;

NOTE 1 The address can be simplified if there is not really enough room on small machines, as long as the manufacturer (and, where applicable, his/her authorized representative) can always be identified so that mail is able to reach the company.

— designation of series or type;

NOTE 2 The designation of the tool can be achieved by a combination of letters and numbers.

— serial number or batch number;

— year of construction, that is the year in which the manufacturing process is completed;

  — for pneumatic non-rotary percussive power tools:

    — rated air pressure marked as (max.);

  — for hydraulic non-rotary percussive power tools:

    — the nominal pressure and flow,

    — the maximum allowable setting for the pressure relief valve.

Non-rotary percussive power tools shall be permanently marked with a graphical symbol in accordance with Annex C showing that the operator's instructions shall be read before work starts.

6.2 Instructions handbook

6.2.1 General

For the information that is being provided to the user, the content of Clause 6 together with ISO 12100:2010, 6.4.5.2 and 6.4.5.3, apply.

The information provided by the manufacturer is an important, but not exclusive basis, for safe use of the non-rotary percussive power tool. It shall provide sufficient information for the end user to perform an initial risk assessment.

The hazards identified in 6.2.2.4 to 6.2.2.11 are foreseeable in the general use of non-rotary percussive power tools. The information provided with the non-rotary percussive power tool shall state that the user or the user's employer should assess the specific risks that can be present as a result of each use.

The instructions handbook shall contain information relating to at least the following:

— name and address of the manufacturer or supplier or any other agent responsible for placing the non-rotary percussive power tool on the market;

— designation of the series or type;

— operating instructions; see 6.3;

— information on noise emission; see 6.4.2;

— information on vibration transmitted to the hands of the operator; see 6.4.3;

— maintenance instructions; see 6.5;

— explanations of any symbols marked on the non-rotary percussive power tool; see Annex C;

— information about residual risks and how to control them.

6.2.2 Operator's instructions

6.2.2.1 General

The instructions and warnings stated in 6.2.2 to 6.2.4 shall be given with all non-rotary percussive power tools unless the risk assessment shows that they are not relevant to a particular non-rotary percussive power tool. Words of equivalent meaning may be used.

6.2.2.2 Statement of use

The operator's instructions shall include a description of the correct use of the non-rotary percussive power tool and make reference to the appropriate inserted tools. The operator's instructions shall state that any other use is forbidden. Foreseeable misuse of the non-rotary percussive power tool, which experience has shown to occur, shall be warned against.

6.2.2.3 Allowance for user

The operator's instructions shall be written primarily for professional users. Where a tool can be used by non-professional users, additional information for use shall be provided.

6.2.2.4 General safety rules

— For multiple hazards, read and understand the safety instructions before installing, operating, repairing, maintaining, changing accessories on, or working near the non-rotary percussive power tool. Failure to do so can result in serious bodily injury.

— Only qualified and trained operators should install, adjust or use the non-rotary percussive power tool.

— Do not modify this non-rotary percussive power tool. Modifications can reduce the effectiveness of safety measures and increase the risks to the operator.

— Do not discard the safety instructions; give them to the operator.

— Do not use the non-rotary percussive power tool if it has been damaged.

— Tools shall be inspected periodically to verify the ratings and markings required by this part of ISO 11148 are legibly marked on the tool. The employer/user shall contact the manufacturer to obtain replacement marking labels when necessary.

6.2.2.5 Projectile hazards

— Disconnect the non-rotary percussive power tool from the energy source when changing inserted tool or accessories.

— Be aware that failure of the workpiece, or accessories, or even of the inserted tool itself can generate high-velocity projectiles.

— Always wear impact-resistant eye protection during the operation of the non-rotary percussive power tool. The grade of protection required should be assessed for each use.

— For overhead work, wear a safety helmet.

— The risks to others should also be assessed at this time.

— Ensure that the workpiece is securely fixed.

— Never operate a tool unless the inserted tool is retained in the tool with a proper retainer.

— To avoid injury, retainer parts shall be replaced when they become worn, cracked or distorted.

— Hold the inserted tool firmly against the work surface before starting the tool.

6.2.2.6 Operating hazards

— Use of the tool can expose the operator's hands to hazards, including impacts, cuts and abrasions and heat. Wear suitable gloves to protect the hands.

— Operators and maintenance personnel shall be physically able to handle the bulk, weight and power of the tool.

— Hold the tool correctly; be ready to counteract normal or sudden movements and have both hands available.

— Maintain a balanced body position and secure footing.

— Release the start-and-stop device in the case of an interruption of the energy supply.

— Use only lubricants recommended by the manufacturer.

— Avoid direct contact with the inserted tool during and after use as it can become hot.

— Personal protective safety glasses shall be used; suitable gloves and protective clothing are recommended.

6.2.2.7 Repetitive motions hazards

— When using a non-rotary percussive power tool to perform work-related activities, the operator can experience discomfort in the hands, arms, shoulders, neck or other parts of the body.

— While using a non-rotary percussive power tool, the operator should adopt a comfortable posture while maintaining a secure footing and avoiding awkward off-balanced postures. The operator should change posture during extended tasks, which can help avoid discomfort and fatigue.

— If the operator experiences symptoms, such as persistent or recurring discomfort, pain, throbbing, aching, tingling, numbness, burning sensations or stiffness, these warning signs should not be ignored. The operator should tell the employer and consult a qualified health professional.

6.2.2.8 Accessory hazards

— Disconnect the non-rotary percussive power tool from the energy supply before changing the inserted tool or accessory.

— Use only sizes and types of accessories and consumables that are recommended by the non-rotary percussive power tool manufacturer; do not use other types or sizes of accessories and consumables.

— For hammers, where appropriate, never use any chisel as a hand-struck tool. They are specifically designed and heat-treated for use only in non-rotary percussive power tools.

— For hammers and breakers, where appropriate, never use blunt chisels, as they require excessive pressure and can break from fatigue. Blunt tool-pieces can increase vibration and, therefore, sharp tools should always be used.

— For hammers, where appropriate, never cool a hot accessory in water. Brittleness and early failure can result.

— For hammers, where appropriate, chisel breakage or tool damage can result from misuse of using the tool as a lever, e.g. prising. Take smaller “bites” to avoid getting stuck.

— Avoid direct contact with the inserted tool during and after use, as it can be hot or sharp.

6.2.2.9 Workplace hazards

— Slips, trips and falls are major causes of workplace injury. Be aware of slippery surfaces caused by use of the tool and also of trip hazards caused by the air line or hydraulic hose.

— Proceed with care in unfamiliar surroundings. Hidden hazards, such as electricity or other utility lines, can exist.

— The non-rotary percussive power tool is not intended for use in potentially explosive atmospheres and is not insulated against coming into contact with electric power.

— Make sure there are no electrical cables, gas pipes, etc., that can cause a hazard if damaged by use of the tool.

6.2.2.10 Dust and fume hazards

— Dust and fumes generated when using non-rotary percussive power tools can cause ill health (for example cancer, birth defects, asthma and/or dermatitis); risk assessment and implementation of appropriate controls for these hazards are essential.

— Risk assessment should include dust created by the use of the tool and the potential for disturbing existing dust.

— Operate and maintain the non-rotary percussive power tool as recommended in the instructions handbook, to minimize dust or fume emissions.

— Direct the exhaust so as to minimize the disturbance of dust in a dust-filled environment.

— Where dust or fumes are created, the priority shall be to control them at the point of emission.

— All integral features or accessories for the collection, extraction or suppression of airborne dust or fumes should be correctly used and maintained in accordance with the manufacturer's instructions.

— Select, maintain and replace the consumable/inserted tool as recommended in the instructions, to prevent an unnecessary increase in dust or fumes.

— Use respiratory protection in accordance with employer's instructions and as required by occupational health and safety regulations.

6.2.2.11 Noise hazards

— Exposure to high noise levels can cause permanent, disabling hearing loss and other problems, such as tinnitus (ringing, buzzing, whistling or humming in the ears). Therefore, a risk assessment and implementation of appropriate controls for these hazards are essential.

— Appropriate controls to reduce the risk may include actions, such as damping materials to prevent workpieces from "ringing".

— Use hearing protection in accordance with employer's instructions and as required by occupational health and safety regulations.

— Operate and maintain the non-rotary percussive power tool as recommended in the instructions handbook, to prevent an unnecessary increase in noise levels.

— Select, maintain and replace the consumable/inserted tool as recommended in the instructions handbook, to prevent an unnecessary increase in noise.

— If the non-rotary percussive power tool has a silencer, always ensure it is in place and in good working order when the non-rotary percussive power tool is operating.

6.2.2.12 Vibration hazards

The information for use shall draw attention to vibration hazards that have not been eliminated by design and construction and remain as residual vibration risks. It shall enable employers to identify the circumstances in which the operator is likely to be at risk from vibration exposure. If the vibration-emission value obtained using ISO 28927-6 for rammers, ISO 28927-9 for hammers and breakers and ISO 28927-10 for scaling hammers and needle scalers does not adequately represent the vibration emission in the intended uses (and foreseeable misuses) of the machine, additional information and/or warnings shall be supplied to enable the risks arising from vibration to be assessed and managed.

— Exposure to vibration can cause disabling damage to the nerves and blood supply of the hands and arms.

— Wear warm clothing when working in cold conditions and keep your hands warm and dry.

— If you experience numbness, tingling, pain or whitening of the skin in your fingers or hands, stop using the non-rotary percussive power tool, tell your employer and consult a physician.

— Operate and maintain the non-rotary percussive power tool as recommended in the instructions handbook, to prevent an unnecessary increase in vibration.

— Do not hold the inserted tool with the free hand, as this increases vibration exposure.

— Hold the tool with a light but safe grip, taking account of the required hand reaction forces, because the risk from vibration is generally greater when the grip force is higher.

— Keep suspended handles in the central position and avoid pushing the handles into the end stops.

— For breakers, cut small "bites" of concrete to prevent the tool from jamming.

— For breakers, move the cutting tool every few seconds. Stop the breaker when lifting the tool to change position, because vibration is high when pulling up on the handles.

6.2.3 Additional safety instructions for pneumatic power tools

— Air under pressure can cause severe injury:

  — always shut off air supply, drain hose of air pressure and disconnect tool from air supply when not in use, before changing accessories or when making repairs;

  — never direct air at yourself or anyone else.

— Whipping hoses can cause severe injury. Always check for damaged or loose hoses and fittings.

— Cold air shall be directed away from hands.

— Do not use quick-disconnect couplings at tool inlet. Use hardened steel (or material with comparable shock resistance) threaded hose fittings.

— Whenever universal twist couplings (claw couplings) are used, lock pins shall be installed and whipcheck safety cables shall be used to safeguard against possible hose-to-tool and hose-to-hose connection failure.

— Do not exceed the maximum air pressure stated on the tool.

— Never carry an air tool by the hose.

6.2.4 Additional safety instructions for hydraulic power tools

— Do not exceed the maximum relief-valve setting stated on the tool.

— Carry out a daily check for damaged or worn hoses or hydraulic connections and replace if necessary.

— Use only clean oil and filling equipment.

— Power units require a free flow of air for cooling purposes and should, therefore, be positioned in a well ventilated area free from hazardous fumes.

— Ensure that couplings are clean and correctly engaged before operation.

— Do not inspect or clean the tool while the hydraulic power source is connected. Accidental engagement of the tool can cause serious injury.

— Do not install or remove the tool while the hydraulic power source is connected. Accidental engagement of the tool can cause serious injury.

— Be sure all hose connections are tight.

— Wipe all couplers clean before connecting. Failure to do so can result in damage to the quick couplers and cause overheating.

Instructions shall be given that only hydraulic fluid recommended by the manufacturer shall be used.

NOTE It is advisable to check with the manufacturer whether or not non-flammable fluids can be used.

6.2.5 Specific safety instructions

Warnings shall be given about any specific or unusual hazards associated with the use of the non-rotary percussive power tool. Such warnings shall indicate the nature of the hazard, the risk of injury and the avoidance action to take.

6.3 Operating instructions

The instructions shall include, where appropriate,

— instructions for setting up or fixing the non-rotary percussive power tool in a stable position as appropriate for non-rotary percussive power tools that can be mounted in a support;

— assembly instructions, accessories and inserted tools;

— illustrated description of functions;

— limitations on tool use due to environmental conditions;

— instructions for setting and testing;

— general instructions for use, including changing inserted tools and limits on the size and type of workpiece.

6.4 Data

6.4.1 General

The instructions shall include the information on the data plate and the following:

— mass of the non-rotary percussive power tool;

— for hydraulic non-rotary percussive power tools:

  — specification of the coupling,

  — specification of hoses with regard to pressure and flow,

  — maximum inlet temperature of the inlet fluid.

6.4.2 Noise

6.4.2.1 Declaration of emission

The instructions shall include a noise-emission declaration in accordance with ISO 15744.

6.4.2.2 Additional information

If the values for noise emissions obtained using the appropriate tests defined in 5.2 do not adequately represent the emissions during the intended uses of the machine, additional information and/or warnings shall be supplied to enable the potential risks to be assessed and managed.

Information on noise emission shall also be provided in the sales literature describing the performance characteristics of machinery.

6.4.3 Vibration

6.4.3.1 Declaration of emission

The instructions shall include the vibration-emission value and uncertainty as specified in 5.3 and the reference number of the test code, ISO 28927-6, ISO 28927-9 or ISO 28927-10.

6.4.3.2 Additional information

If the values for vibration emissions obtained using the appropriate tests defined in 5.3 do not adequately represent the emissions during the intended uses of the machine, additional information and/or warnings shall be supplied to enable the potential risks to be assessed and managed.

Information on vibration emission should also be provided in the sales literature.

6.5 Maintenance instructions

The maintenance instructions shall contain

— instructions to keep the non-rotary percussive power tools safe by regular preventative maintenance;

— information on when the regular preventative maintenance shall be carried out, for instance, after a specified time of operation, a specified number of cycles/operations or a stated number of times per year;

— instructions for disposal so as not to expose personnel and the environment to hazards;

— list of the service operations that the user should carry out;

— instructions for lubrication, if required;

— instructions to check the speed and make a simple check of the vibration level after each service;

— instructions to check the speed regularly;

— specifications of the spare parts for use when these affect the health and safety of operators.

Maintenance instructions shall include precautions to take to avoid exposure to hazardous substances deposited (due to work processes) on the tool.

NOTE Skin exposure to hazardous dust can cause severe dermatitis. If dust is generated or disturbed during the maintenance procedure, it can be inhaled.

Annex A
(informative)

List of significant hazards

This annex contains all the significant hazards, hazardous situations and events, as far as they are dealt with in this part of ISO 11148, identified by risk assessment as significant for this type of machinery and that require action to eliminate or reduce the risk. The following significant hazards are associated with the use of non-rotary percussive power tools. For additional hazards that can occur in non-rotary percussive power tools driven by an internal combustion engine, see Annex D.

Table A.1 — List of significant hazards

Hazard type		Reference to safety requirement	
		By design or guarding	Information for use
1	Mechanical hazards:		
—	cutting	4.2.1, 4.8.1, 4.8.2	
—	crushing		
—	friction or abrasion hazard	4.2.1, 4.8.1, 4.8.2	
—	ejection of parts	4.2.1, 4.2.6, 4.8.1, 4.8.2	6.2.2.4
—	loss of stability	4.2.2	
—	whipping hose		6.2.3
—	ejection from high-pressure hydraulic systems	4.2.4	
—	hose and hose coupling specifications		6.2.4
2	Electrical hazards		6.2.2.8
3	Thermal hazards:		
—	explosions	4.3	
—	health damage due to hot or cold surfaces	4.3	
4	Hazards caused by noise	4.4	6.2.2.10
5	Hazards generated by vibration	4.5	6.2.2.11
6	Hazards generated by materials and substances processed, used or exhausted:		
—	inhalation of harmful dust and fumes	4.6.2	6.2.2.9
—	exhaust air and gases	4.6.1	6.2.2.9, 6.2.3
—	lubricants	4.6.3	6.2.2.5
—	hydraulic fluids		6.2.4
—	parts from working piece		6.2.2.4
7	Hazards caused by neglecting ergonomic principles:		
—	repetitive strain injuries	4.7	6.2.2.6
—	unsuitable postures		6.2.2.5, 6.2.2.6
—	inadequate grip design and tool balance	4.7	
—	neglected use of personal protective equipment		6.2.2.4, 6.2.2.5, 6.2.2.9
8	Hazards caused by the energy supply:		
—	unexpected return of energy supply after a breakdown		6.2.4
—	discharge of high-pressure air or hydraulic fluid		
—	incorrect hydraulic fluid flow and outlet pressure		6.2.4

Table A.1 *(continued)*

Hazard type		Reference to safety requirement	
		By design or guarding	Information for use
9	Hazards caused by missing and/or incorrectly positioned safety related means:		
—	start-and-stop device	4.8.1	6.2.2.5
—	unintentional start	4.8.2	

Annex B
(informative)

Examples of non-rotary percussive power tools covered by this part of ISO 11148

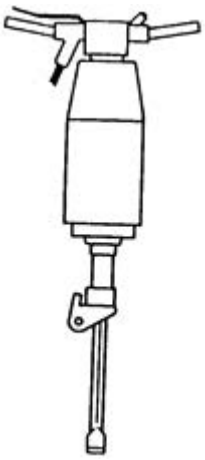


Figure B.1 — Breaker

Figure B.2 — Rammer

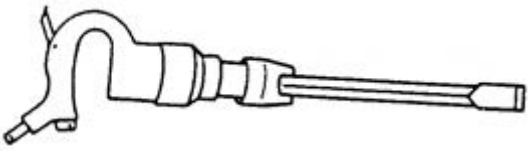


Figure B.3 — Bush hammer

Figure B.4 — Riveting hammer

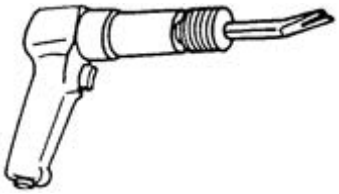


Figure B.5 — Chipping hammer

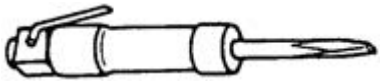


Figure B.6 — Scaling hammer

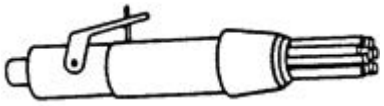


Figure B.7 — Needle scaler

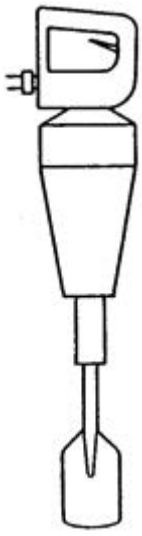


Figure B.8 — Spade

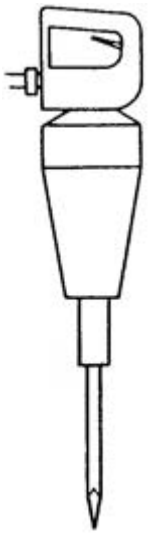


Figure B.9 — Pick hammer

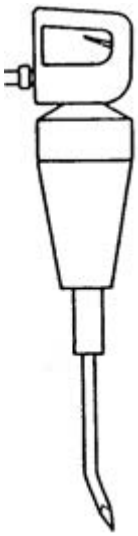


Figure B.10 — Tamper

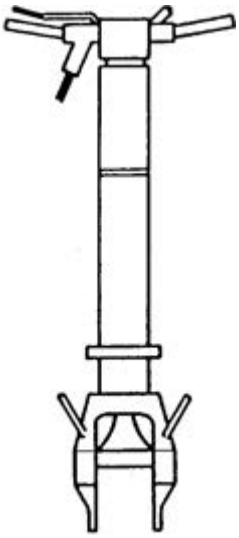


Figure B.11 — Pile driver

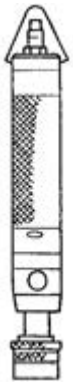
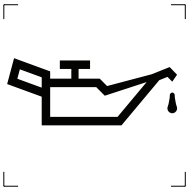
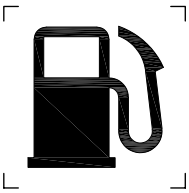


Figure B.12 — Punch

Annex C
(normative)

Symbols for labels and signs

Figure C.1 — Symbols for labels and signs

	Symbol	Significance	Colours	Symbol registration number or source
C.1.1		Warning Minimum requirement. This symbol is normative. Additional symbols and/or text are informative.	Background in the circle: blue Symbol: white Background for warning: orange	ISO 3864-2 ISO 7010-M002
C.1.2		Engine oil	Background: optional Symbol: black	ISO 7000-0248
C1.3		Fuel	Background: optional Symbol: black	Application of ISO 7000-0245

Annex D
(normative)

Additional safety requirements related to internal combustion engine power tools

D.1 General

This annex covers the additional safety requirements related to the internal combustion engines (ICEs) of non-rotary percussive power tools, both rotary and linear and powered by liquid or gaseous fuel.

D.2 List of hazards

Table D.1 lists the hazards that are specific to cases when the energy source is an internal combustion engine.

Table D.1 — List of hazards for tools with an internal combustion engine as an energy source

Hazard type	Reference to safety requirement	
	By design or guarding	Information for use
D.2.1 Mechanical hazards: — incorrect carburettor adjustment	D.3.1	—
D.2.2 Electrical hazards	D.3.2	—
D.2.3 Thermal hazards: — radiation of heat sources	D.3.3	—
D.2.4 Hazards generated by materials and substances processed, used or exhausted: — resulting from contact with or inhalation of harmful fluids, gases, mists and fumes — fires or explosion hazards — incorrect fuel	D.3.4	D.4
D.2.5 Hazards caused by functional disorders: — resulting from unexpected ejection of fluid — breakdown of pressurized gas container	D.3.6	—
D.2.6 Hazards caused by missing or incorrectly positioned safety related measures and means	D.3.5	—

D.3 Safety requirements and measures

D.3.1 Mechanical safety

If carburettors or other fuel-management-system devices are adjustable, it shall be possible to adjust them from the outside without the removal of casing parts; the control devices shall be easily and safely accessible.

D.3.2 Electrical safety

The electrical equipment in the internal combustion engine shall be insulated and covered so that the risk of electric shock or arcing is removed.

D.3.3 Thermal safety

Radiation of heat from hot surfaces and exhaust gases shall not cause a hazard to the operator under normal working conditions.

D.3.4 Materials and substances processed, used or exhausted

Refillable tanks for fuel and oil shall fulfil the following requirements.

— The openings for both fuel and oil shall be positioned so that filling can be carried out without obstacles and so that spillage is avoided.

— The openings shall be positioned such that no spills fall on hot surfaces.

— The tank caps shall have retainers to prevent them from being lost.

— The opening of the fuel tank shall be large enough to enable the filling with a standard canister with a nozzle spout in accordance with ISO 9158 or ISO 9159.

No apparent leakage of fuel from the fuel tank is allowed under normal operating conditions. Leakage from the venting hole in the cap is accepted.

D.3.5 Missing or incorrectly positioned safety-related measures and means

When releasing the start-and-stop device, the movement of the inserted tool is allowed to continue at idling speed, if it cannot cause any hazard.

D.3.6 Pressurized gas container

Containers for liquid petrol gas (LPG) shall fulfil national regulations.

D.4 Information for use

D.4.1 Markings, signs and warnings

The openings for fuel and oil shall be clearly and indelibly marked. Marking on the fuel tank and lubrication tank openings shall be a symbol in accordance with Annex C.

Devices for adjustment of the carburettor or other fuel-metering devices shall be clearly and indelibly marked and indicated on the ICE-driven, non-rotary percussive power tool.

Symbols used shall be clear, unambiguous and shall be explained in the instructions handbook.

D.4.2 Instructions handbook

D.4.2.1 Additional safety instructions for ICE power tools

The following warnings (or equivalent) shall be given with all ICE non-rotary percussive power tools, in addition to those specified in Clause 6.

D.4.2.1.1 Fuel hazards

The following are fuel hazards.

— Fuel is highly flammable:

  — never smoke near the machine;

  — never smoke when filling fuel.

— Spillage of fuel can cause fire:

  — operate the machine with the fuel cap securely in place;

  — when opening the fuel cap, always loosen the cap slowly to relieve any pressure in the tank;

  — never remove the fuel cap or add fuel when the engine is hot. Stop the engine and allow it to cool before adding fuel;

  — do not overfill the tank;

  — do not use a machine that is leaking fuel;

  — ensure that the machine is upright during transportation.

— Include instructions on how to transport the non-rotary percussive power tool so as to minimize the risk of fuel leakage.

— Include instructions on how to adjust the carburettor or other fuel-metering device.

— Specify that empty LPG containers shall be taken care of and sent back to the retailer.

D.4.2.1.2 Inhalation hazards

Inhalation of exhaust fumes can cause death by asphyxiation. Do not operate the machine in an unventilated environment or in a closed pit where the surroundings hinder or prevent air circulation.

D.4.2.1.3 High-temperature hazards

The following are high-temperature hazards.

— The exhaust pipe and other machine parts can get very hot during operation, and can remain hot during a period of time after the machine has been shut off:

  — never touch the exhaust pipe or any other part of the machine before it has cooled down;

  — wait until the inserted tool has cooled down before performing maintenance on the machine.

— Hot parts and hot exhaust gases can cause materials in contact or nearby to burn or explode. Do not use or leave the machine near flammable material, gases or dust particles.

D.4.2.1.4 Consumable hazards

The following are consumable hazards.

— Fuel and oil can penetrate the skin and cause permanent damage:

  — wear safety gloves resistant to fluids used;

  — do not use your fingers to check for fluid leaks;

  — consult a physician if fuel or oil has penetrated the skin.

D.4.2.2 Operating instructions

The operating instructions for ICE non-rotary percussive power tools shall, in addition to the information listed in Clause 6, also

— include instructions on how to transport the non-rotary percussive power tool so as to minimize the risk of fuel leakage;

— instruct how to adjust the carburettor or other fuel-metering device;

— specify that empty LPG containers shall be taken care of and sent back to the retailer.

D.4.2.3 Data

In addition to the information specified in 6.4, the fuel quality, (i.e. for petrol, the lead content and octane number, and for LPG, the specified class) shall also be included.

D.4.2.4 Maintenance instructions

The maintenance instructions shall contain instructions for checking electrical cables and electric insulation.

Bibliography

NOTE The documents listed are not referred to as normative in the text of this part of ISO 11148, however they have a bearing on the specifications and are listed for information. This is not an exhaustive list.

[1] ISO 2787, *Rotary and percussive pneumatic tools — Performance tests*

[2] ISO 3857-1, *Compressors, pneumatic tools and machines — Vocabulary — Part 1: General*

[3] ISO 3864-1, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs and safety markings*

[4] ISO 3864-4, *Graphical symbols — Safety colours and safety signs — Part 4: Colorimetric and photometric properties of safety sign materials*

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

[6] ISO/TR 11688-1, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning*

[7] ISO/TR 11688-2, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 2: Introduction to the physics of low-noise design*

[8] ISO 11690 (all parts), *Acoustics — Recommended practice for the design of low-noise workplaces containing machinery*

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

[10] EN 614-1, *Safety of machinery — Ergonomic design principles — Part 1: Terminology and general principles*

[11] EN 626 (all parts), *Safety of machinery — Reduction of risks to health from hazardous substances emitted by machinery*

[12] EN 894-3, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 3: Control actuators*

[13] EN 982, *Safety of machinery — Safety requirements for fluid power systems and their components — Hydraulics*

[14] EN 983, *Safety of machinery — Safety requirements for fluid power systems and their components — Pneumatics*

[15] EN 13463-1, *Non-electrical equipment for use in potentially explosive atmospheres — Part 1: Basic method and requirements*

[16] IEC 60745-1, *Hand-held motor-operated tools — Part 1: General requirements*

[17] IEC 61310-1, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, acoustic and tactile signals*

[18] IEC 61310-2, *Safety of machinery — Indication, marking and actuation — Part 2: Requirements for marking*

[19] E.H.T.M.A., *Recommendations for the correct use of hand-held or portable hydraulic tools and associated portable power source*s, June 1991[2)]

2) EHTMA publications can be obtained from: http://www.ehtma.com or mailto:secretary@ehtma.com.

[20] 79/113/EEC, *Council Directive relating to the measurement of the sound level of construction plant and equipment*

[21] 84/537/EEC, *Council Directive relating to the permissible sound power level of powered hand-held concrete-breakers and picks*

[22] CR 1030-1, *Hand-arm vibration — Guidelines for vibration hazards reduction — Part 1: Engineering methods by design of machinery*

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