INTERNATIONAL STANDARD

ISO 11148-3

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

Part 3: Drills and tappers

Machines portatives à moteur non électrique — Exigences de sécurité —

Partie 3: Perceuses et taraudeuses

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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 11148-3 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 11148-3:2010), 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 3:
Drills and tappers

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 "drills and tappers") intended for rotary drilling of holes in all kinds of material, e.g. wood, metal, concrete and plastics, or for tapping and cleaning threads in metal and plastics. The drills and tappers 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 balancer.

This part of ISO 11148 is applicable to

— drills;

— heavy duty drills with two handles;

— tappers.

NOTE 1 For examples of drills and tappers, see Annex B.

This part of ISO 11148 is not applicable to special requirements and modifications of drills and tappers for the purpose of mounting them in fixtures.

This part of ISO 11148 deals with all significant hazards, hazardous situations or hazardous events when drills and tappers are used as intended and under conditions of misuse that are reasonably foreseeable by the manufacturer, with the exception of their use 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 5391, *Pneumatic tools and machines — Vocabulary*

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

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

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.

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 28927-5, *Hand-held portable power tools — Test methods for evaluation of vibration emission — Part 5: Drills and impact drills*

NOTE ISO 28927-5 does not apply to tappers.

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.

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 drill or tapper to perform the intended work

3.1.3
service tool
tool intended for performing maintenance or service on the drill or tapper

3.1.4
control device
device to start and stop the drill or tapper 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 drill or tapper 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 the 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 drill or tapper 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 drill or tapper

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 drill or tapper 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 ensure 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 drill or tapper

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 drills and tappers

3.2.1
drill
rotary power tool driving an output spindle, typically through a gearbox

NOTE The output spindle is normally fitted with chuck or Morse taper, or another socket into which is fitted an inserted tool, e.g. drill bit or reamer, making the drill or tapper suitable for drilling, reaming, tube expanding and for boring in metal, wood and other materials.

3.2.2
drill bit
inserted tool for drilling operation

3.2.3
reamer
inserted tool for reaming operation

3.2.4
tap
inserted tool for tapping operation

3.2.5
tapper
power tool with a rotary spindle for the tapping of threaded holes; the rotation of the spindle is reversible

3.2.6
reaction bar
mechanical component attached to or forming part of the tool for the sole purpose of transmitting a reaction torque

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 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 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 the drills and tappers 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 drill or tapper shall be so designed that it can be laid aside and remain in a stable position on a plane surface.

4.2.3 Chuck keys and service tools

Chuck keys and service tools used with drilling and tapping chucks shall be so designed that they drop easily out of position when released. They may be fixed to the drill or tapper by design, e.g. clip, but not by a chain or string or other similar means. The avoidance of entanglement should be considered; see 6.2.2.5.

4.2.4 Hydraulic fluid ejection

Hydraulic systems of the drills and tappers shall be enclosed so as to give protection against high-pressure fluid ejection.

4.2.5 Guards

Guards covering the chuck and the inserted tools are not required.

4.2.6 Spindles

4.2.6.1 Spindle threads

When threaded spindles are used, the thread direction shall be such that the chuck or attachment shall tend to tighten during tool operation, or a means shall be provided to secure the chuck.

4.2.6.2 Reversible tools

Spindles for reversible tools shall be designed to drive the chuck in both directions without loosening the chuck and mounting. If a threaded spindle is used, a means shall be provided to secure the chuck.

4.2.7 Power tool construction

The drill or tapper 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. Verification shall be made in accordance with 5.5.

4.3 Thermal safety

Surface temperatures of parts of the drills and tappers 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 drill or tapper 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 drills and tappers with reduced noise emission are contained in ISO/TR 11688-1 and ISO/TR 11688-2.

The noise emission from using drills and tappers has three main sources:

— the drill or tapper 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 drill or tapper.

Typical sources of noise emitted by the drill or tapper itself are

a) the motor and drive mechanism;

b) the exhaust air or gases;

c) the 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 drill or tapper 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 drills and tappers with reduced vibration emission are contained in CR 1030-1.

Typical sources of vibration emitted by a drill or tapper 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 drills and tappers:

a) increasing inertia;

b) 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

Drills and tappers driven with compressed air, 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 drill or tapper 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

4.7.1 Design of the handle

Gripping areas of the drills and tappers shall be designed to provide convenient, effective means for the operator to exercise full control over the drill or tapper.

Handles and other parts used for gripping the drill or tapper shall be designed to ensure that the operator is able to grip the drill or tapper 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.

Drills and tappers 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 the normal feed force and reaction torque can be transmitted in an ergonomic way from the hand of the operator to the drill or tapper.

The strength of a removable handle and the method of fixing it shall be appropriate to the intended principal use.

4.7.2 Suspension device

Provision shall be made, where appropriate, to enable the attachment to the drill or tapper of a suspension device in order to reduce, where practicable, the physical strain placed on the operator by the weight of the drill or tapper. The fitting of a suspension device shall not introduce an additional hazard.

4.7.3 Reaction torque

Drills and tappers shall be designed so that the effect of reaction torque is reduced as much as possible. This can be done by mounting a support handle or through other suitable means.

Straight, rotary tools shall have provisions for mounting a second handle, when the reaction torque absorbed by the operator can exceed 4 N·m.

Pistol grip tools shall have a provision for mounting a second handle, when the reaction torque absorbed by the operator can exceed 10 N·m.

4.8 Controls

4.8.1 Start-and-stop device

Drills and tappers 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 drill or tapper 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 drill or tapper 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.

4.8.2 Unintentional start

The start-and-stop device for drills and tappers with a chuck capacity larger than 10 mm shall be so designed, positioned or guarded that the risk of unintentional start is minimized. Verification shall be made in accordance with 5.4.

4.8.3 Actuating forces

For drills and tappers that are intended for frequent starts or for use with precision work, the actuating force shall be small.

For drills and tappers 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.

4.8.4 Directional control devices

A drill or tapper starting in an unintended direction can be hazardous due to the unexpected direction of the power tool's movement. If it is possible for the drill or tapper to start in the reverse direction, the positions of the control device that control the forward and the reverse movements shall be clearly marked by arrows showing the rotational direction of the spindle.

Forward is defined as the clockwise direction as seen from the operator's position.

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 the 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 drills shall be measured and reported in accordance with ISO 28927-5. The vibration total value for tappers shall be measured and reported in accordance with ISO 20643.

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

Compliance with 4.5 may be verified through the comparison of the vibration-emission values with those of 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 as follows.

The drill or tapper with a chuck capacity larger than 10 mm shall be connected to the energy supply and placed in any possible position and pulled over the horizontal plane by its hose.

Continuous operation of the start-and-stop device shall not occur.

5.5 Power tool construction

Compliance with 4.2.7 shall be verified by dropping a sample drill or tapper without inserted 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 the subclause(s) of this part of ISO 11148 or other standard]
4.2.1 Surfaces, edges and corners	X	—	—	—
4.2.2 Supporting surface and stability	X	X	—	—
4.2.3 Chuck keys and service tools	X	X	—	—
4.2.4 Hydraulic fluid ejection	X	—	—	—
4.2.6.1 Spindle threads	—	X	—	—
4.2.6.2 Reversible tools	—	X	—	—
4.2.7 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 28927-5 ISO 20643 5.3
4.6.1 Exhaust air or gas	—	X	—	—
4.6.2 Dust and fumes	X	X	—	—
4.7.1 Design of the handle	X	—	—	—
4.7.2 Suspension device	X	X	—	—
4.7.3 Reaction torque	X	X	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	—	—
4.8.4 Directional control devices	X	X	—	—

6 Information for use

6.1 Marking, signs and written warnings

Drills and tappers 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;

— rated speed, expressed in revolutions per minute:

  — for pneumatic drills and tappers:

    — the rated air pressure marked as (max.);

  — for hydraulic drills and tappers:

    — the nominal pressure and flow;

    — the maximum allowable setting for the pressure relief valve.

Drills and tappers 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.

The direction of rotation, as required in 4.8.3, shall be permanently marked in accordance with Annex C.

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 tool. It shall provide sufficient information for the end user to perform an initial risk assessment.

The hazards identified in 6.2.2.3 to 6.2.2.12 are foreseeable in the general use of hand-held drills and tappers. The information provided with the tool shall state that the user or the user's employer shall 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 drill or tapper on the market;

— designation of the series or type;

— operating instructions; see 6.3;

— information on noise emission; see 6.4.2;

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

— maintenance instructions; see 6.5;

— explanations of any symbols marked on the drill or tapper; 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 drills and tappers unless the risk assessment shows that they are not relevant to a particular drill or tapper. 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 drill or tapper and make reference to the appropriate inserted tools. The operator's instructions shall state that any other use is forbidden. Foreseeable misuse of the drill or tapper, which experience has shown to occur, shall be warned against.

If the drill is intended as a prime mover for other functions such as sawing, screw driving and hedge trimming, the operator's instructions shall make reference to instructions for those applications.

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 drill or tapper. Failure to do so can result in serious bodily injury.

— Only qualified and trained operators should install, adjust or use the drill or tapper.

— Do not modify this drill or tapper. 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 drill or tapper if it has been damaged.

— Tools shall be inspected periodically to verify that 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

— Be aware that the 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 drill or tapper. The grade of protection required should be assessed for each use.

— Remove the chuck key before drilling starts.

— Ensure that the workpiece is securely fixed.

6.2.2.6 Entanglement hazards

Choking, scalping and/or lacerations can occur if loose clothing, personal jewellery, neckware, hair or gloves are not kept away from the tool and accessories.

6.2.2.7 Operating hazards

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

— High-reaction torque can be developed in the case of stalling, which can be caused by excessive loads being applied to the drill bit, by the drill bit snagging on the material being drilled into or by the drill bit breaking through the material being drilled.

— In cases where the means to absorb the reaction torque are requested, it is recommended to use a suspension arm whenever possible. If that is not possible, side handles are recommended for straight-case tools and pistol-grip tools. In any case, it is recommended to use a means to absorb the reaction torque above 4 N□m for straight tools and above 10 N□m for pistol-grip tools.

— Keep hands away from the rotating chuck and drill bit.

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

— Use only lubricants recommended by the manufacturer.

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

6.2.2.8 Repetitive motions hazards

— When using a drill or tapper 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 drill or tapper, the operator should adopt a comfortable posture while maintaining a secure footing and avoiding awkward or 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.

6.2.2.9 Accessory hazards

— Disconnect the drill or tapper from the energy supply before fitting or changing the inserted tool or accessory.

— Use only sizes and types of accessories and consumables that are recommended by the drill or tapper manufacturer; do not use other types or sizes of accessories and consumables.

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

6.2.2.10 Workplace hazards

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

— Proceed with care in unfamiliar surroundings. There can be hidden hazards, such as electricity or other utility lines.

— The drill or tapper is not intended for use in potentially explosive atmospheres and is not insulated against coming into contact with electric power.

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

6.2.2.11 Dust and fume hazards

— Dust and fumes generated when using drills and tappers 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 the dust created by the use of the tool and the potential for disturbing existing dust.

— Operate and maintain the drill or tapper as recommended in these instructions, to minimize dust and fume emissions.

— Direct the exhaust so as to minimize 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 and 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 handbook 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.

6.2.2.12 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 drill or tapper as recommended in the instructions handbook, to prevent an unnecessary increase in the noise level.

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

— If the drill or tapper has a silencer, always ensure that it is in place and in good working order when the drill or tapper is operating.

6.2.2.13 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 28927-5 for drills or ISO 20643 for tappers 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 drill or tapper, tell your employer and consult a physician.

— Operate and maintain the drill or tapper as recommended in the instructions handbook, to prevent an unnecessary increase in vibration levels.

— Do not allow the inserted tool to chatter on the workpiece, as this is likely to cause a substantial increase in vibration.

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

— Support the weight of the tool in a stand, tensioner or balancer, if possible.

— 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.

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 the hands.

— 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 enquire of 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 drill or tapper. 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 drill or tapper in a stable position, appropriate for drills and tappers that can be mounted in a support;

— assembly instructions, including recommended guards, 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 drill or tapper;

— for hydraulic drills and tappers:

  — 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 as 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 an assessment and the management of the associated risks.

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 28927-5 for drills or ISO 20643 for tappers.

6.4.3.2 Additional information

If the vibration-emission values 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 an assessment and the management of the associated risks.

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 drills and tappers 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 to use when these affect the health and safety of operators.

Maintenance instructions shall also include the 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 drills and tappers. For additional hazards that can occur in association with drills and tappers that are 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	6.2.2.6, 6.2.2.8
—	drawing in or trapping (caused by hair, clothing, etc., getting entangled in a rotating drill or tapper)	4.8.1	6.2.2.5, 6.2.2.8
—	friction or abrasion hazard	4.2.1	6.2.2.6, 6.2.2.8
—	whipping hose		6.2.3
—	ejection from hydraulic fluid systems	4.2.4	
—	ejection of parts	4.2.3, 4.2.6.1, 4.2.6.2, 4.2.7	6.2.2.4
—	loss of stability	4.2.2	6.2.3, 6.4.1
—	hose and hose coupling specifications		
2	Electrical hazards		6.2.2.9
3	Thermal hazards:		
—	explosions	4.3	6.2.2.9
—	health damage due to hot or cold surfaces	4.3	6.2.2.8
4	Hazards caused by noise	4.4	6.2.2.11, 6.4.2
5	Hazards generated by vibration	4.5	6.2.2.12, 6.4.3
6	Hazards generated by materials and substances processed, used or exhausted:		
—	inhalation of harmful dust and fumes	4.6.2	6.2.2.10
—	exhaust air	4.6.1	6.2.3
—	lubricants	4.6.3	6.2.2.6
—	hydraulic fluid		
7	Hazards caused by neglecting ergonomic principles:		
—	repetitive strain injuries	4.7.1, 4.7.2, 4.7.3	6.2.2.7
—	unsuitable postures		6.2.2.6, 6.2.2.7
—	inadequate grip design and tool balance	4.7.1	6.2.2.6
—	effects of reaction forces upon operator	4.7.3	6.2.2.6
—	neglected use of personal protection equipment		6.2.2.6, 6.2.2.10, 6.2.2.11
8	Hazards caused by the energy supply:		
—	unexpected return of energy supply after a breakdown		6.2.3

Table A.1 *(continued)*

Hazard type		Reference to safety requirement	
		By design or guarding	Information for use
—	discharge of high-pressure air or hydraulic fluid		6.2.3, 6.2.4
—	incorrect hydraulic fluid flow and outlet pressure		6.2.4
9	Hazards caused by missing and/or incorrectly positioned safety related means:		
—	start-and-stop device	4.8.1	6.2.2.6
—	unintentional start	4.8.2	

Annex B
(informative)

Examples of drills and tappers covered by this part of ISO 11148

Figure B.1 — Drill (straight)

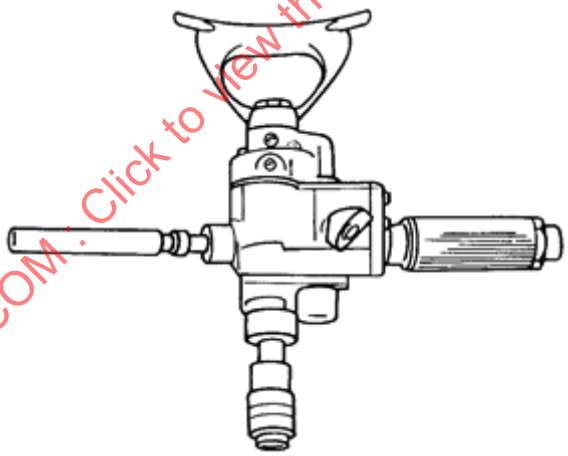


Figure B.2 — Heavy duty drill with two handles

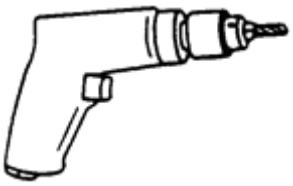


Figure B.3 — Drill (pistol-grip)

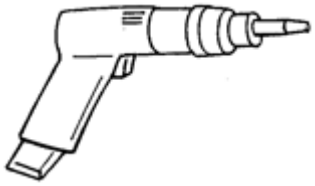


Figure B.4 — Tapper

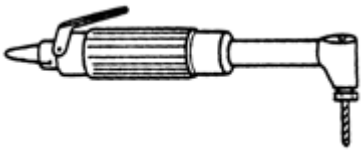
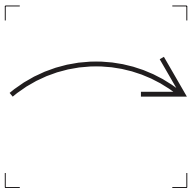
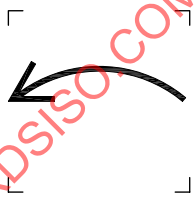


Figure B.5 — Drill (angle)

Annex C
(normative)

Symbols for labels and signs

Table C.1 — Normative symbols for labels and signs

No.	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		Direction of rotation	Background: optional Symbol: black	Application of ISO 7000-0004
C.1.3		Direction of rotation	Background: optional Symbol: black	Application of ISO 7000-0004