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

Part 13: Fastener driving tools

Machines portatives à moteur non électrique — Exigences de sécurité —

Partie 13: Machines à enfoncer les fixations

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Foreword

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

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

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

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

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

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

A list of all parts in the ISO 11148 series can be found on the ISO website.

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 indicated in the Scope.

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

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

Certain parts 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 International Standards of type A and B where such standards are applicable.

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

Part 13: Fastener driving tools

1 Scope

This document specifies safety requirements for hand-held non-electric power tools (hereinafter referred to as "fastener driving tools") intended for installation of a fastener (see Annex B), forming a mechanical connection or attachment with the workpiece which are for example wood and wood-based materials, plastic materials, fibre materials (loose or compacted), cementitious materials, metals and combinations of these materials. The fastener driving tools for fasteners can be powered by compressed air or combustible gases (which may be ignited by a battery or accumulator) and the energy is transmitted to an impacted element by an intermediary component that does not leave the device. These tools are intended to be used by one operator and supported by the operator's hand or hands, with or without a suspension, e.g. a balancer.

This document is applicable to fastener driving tools in which energy is applied to a loaded fastener for the purpose of driving this into a workpiece.

This document is not applicable to fastener driving tools in which the energy for driving fasteners is drawn from powder-actuated cartridges, hydraulics or from any type of electrical supply.

This document does not deal with special requirements and modifications of hand-held power tools for the purpose of mounting them in a fixture.

This document deals with all significant hazards, hazardous situations or hazardous events relevant to fastener driving tools for fasteners when they are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer, with the exception of the use of power tools in potentially explosive atmospheres.

NOTE ISO 80079–36 gives requirements for non-electrical equipment for potentially explosive atmospheres.

2 Normative references

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

ISO 3864-2:2016, *Graphical symbols — Safety colours and safety signs — Part 2: Design principles for product safety labels*

ISO 4871:1996, *Acoustics — Declaration and verification of noise emission values of machinery and equipment*

ISO 7010:2011, *Graphical symbols — Safety colours and safety signs — Registered safety signs*

ISO 8662-11:1999, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 11: Fastener driving tools*

ISO 8662-11:1999/Amd 1:2001, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 11: Fastener driving tools — Amendment 1*

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

ISO 13732-1:2006, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces*

ISO 13732-3:2005, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 3: Cold surfaces*

EN 12096:1997, *Mechanical vibration — Declaration and verification of vibration emission values*

EN 12549:1999+A1:2008, *Acoustics — Noise test code for fastener driving tools — Engineering method*

EN 15895:2011, *Cartridge operated hand-held tools — Safety requirements — Fixing and hard marking tools*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100, ISO 3857-3 and ISO 5391 and the following apply.

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

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1 General terms

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, gaseous or liquid fuel (which may be ignited by a battery or an accumulator) 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

3.1.1.1
pneumatic tool
tool, where energy to drive the fasteners comes from compressed air

3.1.1.2
gas tool
tool, where energy to drive the fasteners comes from combustion of gases

3.1.2
horizontal-down
tool orientation, where the tool nose is normal to a horizontal work surface and pointed downwards

3.1.3
horizontal-up
tool orientation where the tool nose is normal to a horizontal work surface and pointed upwards

3.1.4
vertical
tool orientation where the tool nose is normal to a vertical work surface

3.1.5
production application
high-volume professional application such as pallets, furniture, manufactured housing, upholstery and sheathing

3.2 Terms and definitions related to fastener driving tools

3.2.1
fastener driving tool
hand-held power tool in which energy is applied in a linear motion to a loaded fastener for the purpose of driving the fastener into defined materials

3.2.1.1
coil nailer
nailer that drives fasteners from a collated coil of nails

Note 1 to entry: The primary purpose of this tool being production applications

3.2.1.2
heavy-duty stapler or bradder
stapler or bradder capable of driving

— fasteners of 18 gauge/1,2 mm nominal diameter or heavier wire, or

— fasteners with 0,8 mm nominal thickness or larger, or

— fasteners with 1,2 mm nominal width or larger

Note 1 to entry: These tools are primarily for production applications.

3.2.1.3
light-duty tool
tool capable of driving fasteners where the mass of the fastener is less than 0,5 g and the length is ≤26 mm or less than 0,4 g if the length is ≤36 mm or the tool is operated by hitting the tool in a designated area

3.2.1.4
pinner
tool capable of driving headless fasteners up to 51 mm in length and a maximum gauge of 23 (0,64 mm) diameter

Note 1 to entry: Larger gauge pinners are available.

3.2.1.5
single-blow tool
fastener driving tool that drives the fastener with a single stroke of the driving element

3.2.1.6
multi-blow tool
fastener driving tool that drives the fastener with more than one stroke of the driving element

3.2.1.7
special application tools
tools without a workpiece contact whose fasteners are formed or clamped during application by devices such as integrated anvils or self- contained clinching anvils which prevents free flight of fasteners

3.2.2
fastener
mechanical device used for securing fixings to surfaces, or joining materials together, such as: nails, staples and pins

3.2.3
collating material
material for joining together single fasteners in strips or coils with adhesive, paper or plastic tape, plastic strap or wire

3.2.4
trigger
tool control operated manually by a tool operator

3.2.4.1
actuation mode selector
tool control, manually set by the operator, so that the tool operates in a specific actuation mode

3.2.4.2
dual activation
two devices such as triggers, levers or switches that work in conjunction with each other such that both devices require activation to actuate the tool

Note 1 to entry: A sequence of activation may be necessary for tool actuation.

3.2.5
workpiece contact
control element or assembly that needs to activated before a fastening operation can be performed

3.2.5.1
extended workpiece contact
control element or assembly that is extended from the tool and is retracted by pressing on the workpiece, preventing the tool from driving a fastener when not pressed against the workpiece

3.2.5.2
retracted workpiece contact
workpiece contact that is retracted and extends when the trigger is activated, preventing the tool from driving a fastener when not pressed against the workpiece

3.2.6
full sequential actuation
actuation mode which allows single driving operations via the trigger after the workpiece contact has been operated and further driving operations are only performed after the trigger and the workpiece contact have been returned to the non-driving position

Note 1 to entry: The evaluation of actuation modes is given in 5.2.5.1

3.2.7
single sequential actuation
actuation mode which allows single driving operations via the trigger, after the workpiece contact has been operated, and further driving operations are only performed after the trigger has been returned to the non-driving position whilst the workpiece contact remains in the operating position

3.2.8
contact actuation
actuation mode which allows the tool to operate by operating the workpiece contact whilst the trigger is continually depressed and held

3.2.9
continual contact actuation
actuation mode in which the driving operations continue as long as the trigger and the workpiece contact remain in their operating positions

3.2.10
contact actuation with automatic reversion
actuation mode that is capable of contact actuation or continual contact actuation and reverts to single-sequential actuation, full-sequential actuation, neutral or off if the trigger is depressed for a specified period of time without operation of the workpiece contact

3.2.11
selective actuation
actuation system that allows discrete selection of two or more of the following actuation modes, single sequential actuation, full sequential actuation or contact actuation; however, one or more of the selections shall be single sequential actuation or full sequential actuation

3.2.12
gas container
non-refillable container which stores and dispenses, using a release device, combustible gas, compressed or liquefied

Note 1 to entry: See Figures 1 and 2.

3.2.12.1
metering valve
mechanical or electro-mechanical mechanism designed to control quantity of the combustible gas provided to the gas tool which can be either fitted directly onto the release device, integrated into the release device or be a part of the gas tool

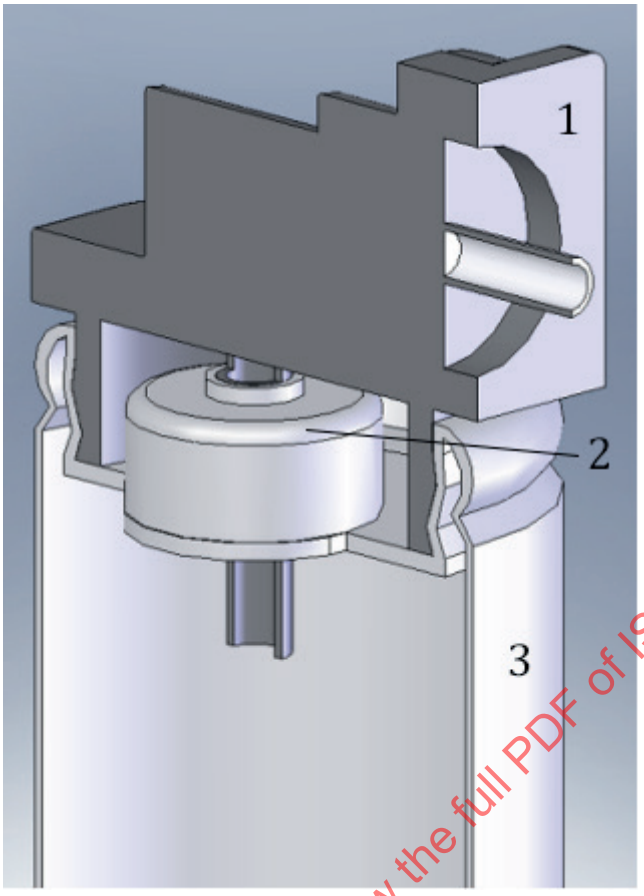
Note 1 to entry: A typical metering valve is shown in Figure 1

3.2.12.2
release device
valve mechanism which allows the combustible contents of the gas container to be dispensed and is a part of the gas container

Note 1 to entry: Typical release devices are shown in Figures 1 and 2.

3.2.12.3
adapter
fitting, typically installed on the gas container by the user, that allows the gas container to be connected to the gas tool

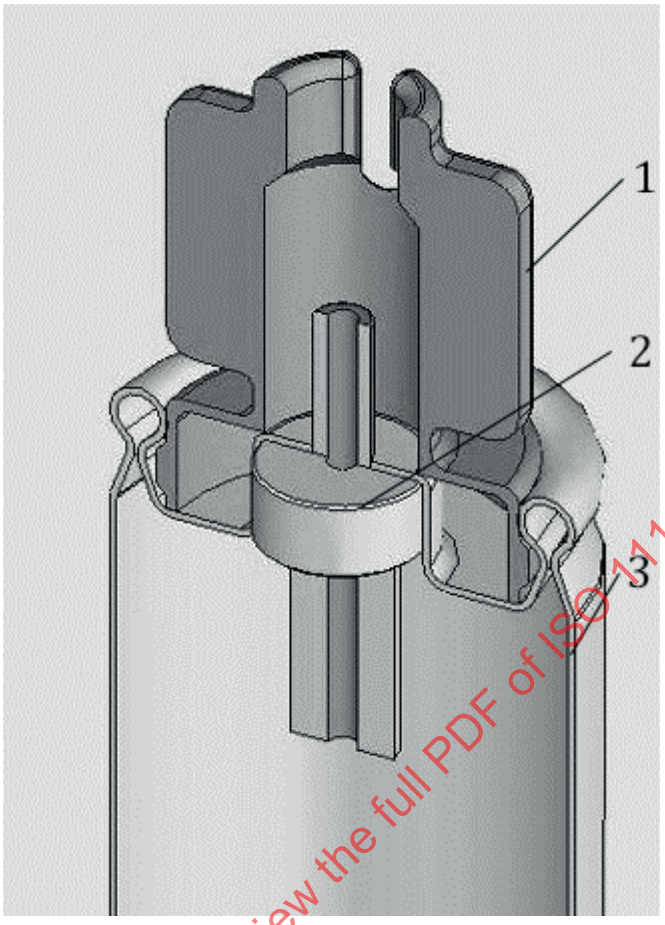
Note 1 to entry: A typical adapter is shown in Figure 2.



Key

1 metering valve
2 release device
3 gas container

Figure 1 — Example of gas container, release device and metering valve



Key

1 adapter
2 release device
3 gas container

NOTE In this case, metering valve (not shown) is a part of the tool.

Figure 2 — Example of gas container, adapter and release device

3.2.12.4
gas container chamber
compartment in the gas tool where the gas container is installed

3.2.13
battery or accumulator
any source of electrical energy generated by direct conversion of chemical energy and consisting of one or more primary battery cells (non-rechargeable) or consisting of one or more secondary battery cells (rechargeable)

3.2.14
tool without workpiece contact
any tool that drives a fastener and which does not have a workpiece contact

3.2.15
single actuation
actuation mode in which the trigger has to be operated for each driving operation

3.2.16
continual actuation
actuation mode in which the driving operations are carried out for as long as the trigger remains in its operating position

3.2.17
pressurized section
chamber(s) of a pneumatic fastener driving tool that is/are pressurized

3.2.18
maximum operating pressure
$P_{s\,max}$
greatest gas or compressed air pressure for which the tool is designed to operate

4 Safety requirements and 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 not dealt with by this document.

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 fastener driving tool that satisfies each requirement, so far as is reasonably practicable, and remains fit for purpose.

4.2 Mechanical safety

4.2.1 Protection against points and edges of fasteners

Fastener driving tools shall be designed in such a way as to prevent injuries caused by the projecting points or edges of fasteners, for example by a protection cover. Exceptions are permissible at the location of the nose if there are technological reasons for such exceptions, for example, on fastener driving tools designed for driving fasteners through holes of punched metal sheets in which the fastener points are used as a locator.

4.2.2 Prevention of unintended ejection of fasteners

4.2.2.1 Prevention of unintended ejection of fasteners during connection/disconnection of the energy supply system

4.2.2.1.1 Connection of the fastener driving tool to the energy supply system shall not perform a driving operation by the tool.

4.2.2.1.2 Disconnection of the fastener driving tool from the energy supply system shall make the tool incapable of a driving operation.

4.2.2.1.3 Pneumatic tools shall be designed to allow the fitting of a quick release coupler.

4.2.2.2 Prevention of accidental trigger operation

The design of fastener driving tools and the placement of the trigger shall be such as to prevent unintentional operation, for example, when the tool is placed on, or moved across, a work surface.

4.2.2.3 Prevention of slipping of fasteners from hard or slippery surfaces like steel and plastic

Tools, with workpiece contacts designed to normally push against hard surfaces like steel or concrete shall be designed in such a way, that the likelihood of the fastener to slip from the hard surface is reduced to a minimum. These tools shall be thus designed that they can only be operated if a force of 1,25 times of the tool weight including the weight of the fasteners but a minimum 50 N is applied to the workpiece contact.

4.2.3 Prevention of free flight of fasteners

4.2.3.1 Fastener driving tools shall be fitted with an extended workpiece contact or a retracted workpiece contact element. No driving operation shall be performed before the workpiece contact is activated. The extended workpiece contact shall have a minimum 5 mm travel before a fastener can be driven. A workpiece contact is not required on light duty tools.

NOTE The requirements for retracted workpiece contacts are given in 4.2.4.2.

4.2.3.2 For tools, other than light-duty tools, it might not be practical to meet the requirements of 4.2.3.1 and for those tools, a workpiece contact is not required, provided the requirements of 4.2.3.3, 4.2.3.4 or 4.2.3.5 are met.

4.2.3.3 Pinners driving fasteners up to 51 mm in length and a maximum 23 gauge (0,64 mm), where viewing/accurate placement is necessary shall operate by a dual activation device which only operates by two sequential dissimilar actions.

4.2.3.4 Special application tools such as carton closing staplers, sisal/bedding tools with fixed anvils, carton pliers.

4.2.3.5 The same degree of safety as provided by 4.2.3.1 can be demonstrated or is obtained with tools such as: hardwood flooring tools, multi-blow metal hardware nailers and palm nailers.

4.2.4 Design of the workpiece contact

4.2.4.1 Extended workpiece contact

To minimize the possibility of a free flying fastener occurrence by accidentally touching the workpiece with the edge or corner of the workpiece contact, and therefore placing the nose outside the workpiece surface, or while being transported, the external dimensions of the workpiece contact (Figure 3) should not be greater than

— l = 18 mm for fastener driving tools with:
  — contact actuation;
  — continuous contact actuation;
  — full sequential actuation using fasteners of a driving length of more than 130 mm,
— l = 30 mm for fastener driving tools with:
  — single sequential actuation;
  — full sequential actuation using fasteners of a driving length of 130 mm or below.

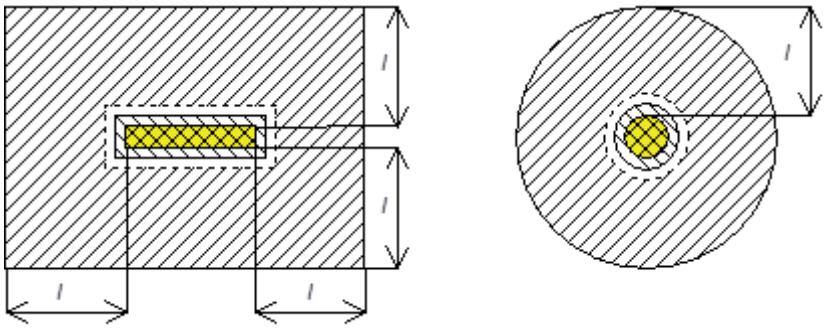


Figure 3 — Extended workpiece contact, examples for outer surface

It is important that the workpiece contact

— is of a robust construction,

— is securely held in place,

— does not give rise to any additional hazard, and

— is not easy to bypass or render non-operational, either intentionally or unintentionally.

4.2.4.2 Retracted workpiece contact

A retracted workpiece contact shall either, only operate when a force equal to the mass as specified in Table 1, including maximum weight of fasteners is applied, or after the workpiece contact, makes contact with the workpiece. In all tool orientations, the workpiece contact shall reliably return to its starting position.

4.2.4.3 Intended resting position

Fastener driving tools and workpiece contact shall be designed in such a way that the workpiece contact does not operate the trigger system when the tool is set down in its intended resting position as specified by the manufacturer. Tools which, in their specified resting position, are also resting on their workpiece contact, shall comply with the test in 5.2.4.3.

4.2.5 Permitted trigger actuation modes

4.2.5.1 Permitted actuation modes for fastener driving tools that require extended or retracted workpiece contact (see Table 1)

Table 1 — Permitted actuation modes for fastener driving tools that require extended or retracted workpiece contact

Maximum length of the fastener	Permitted actuation mode	Operating force for workpiece contact
all	full sequential actuation single sequential actuation	≥30 % of the tool weight[a]
≤100 mm >65 mm	contact actuation selective actuation contact actuation with automatic reversion	≥60 % of the tool weight[a]
≤65 mm	full sequential actuation single sequential actuation contact actuation selective actuation contact actuation with automatic reversion continual contact actuation with automatic reversion continual contact actuation	≥60 % of the tool weight[a]

[a] With maximum mass of fasteners.

Table 1 shall not apply to tools normally designed to work with materials of hard surfaces like steel or concrete. For these tools, see 4.2.5.3.

NOTE The spring load on the workpiece contact can be generated, for example, by metal springs, elastic materials, compressed air operated parts, etc.

4.2.5.2 Actuation modes permitted in Table 1 based on application and utility

All tools, except for light-duty tools and tools for production applications such as heavy-duty staplers or bradders, and coil nailers shall be manufactured with an actuation system meeting the requirements of single sequential actuation, full sequential actuation, selective actuation or contact actuation with automatic reversion. Tools that have selective actuation for contact actuation or continual contact actuation shall be considered as having contact actuation.

Tools manufactured with selective actuation shall be shipped (placed on the market) with their actuation system set as single sequential actuation, full sequential actuation, neutral, or off.

Certain applications and certain users may require an actuation system different from that provided on the tool by the manufacturer, for purposes of functionality and utility. In such cases, another actuation system may be made available and must comply with Table 1. Means for making such other actuation systems available include, but are not limited to, the following:

— Actuation system is provided with but not installed or offered as a conversion option kit from the manufacturer. The manufacturer shall supply all relevant instructions, warnings, and markings applicable to that actuation system as required in 6.1 to 6.3 along with a directive that all relevant instructions, warnings and markings shall remain permanently with the tool and instruction handbook.

— Actuation system is manufactured and shipped as part of the tool, in response to an order from a production application customer.

4.2.5.3 Permitted actuation modes of fastener driving tools designed to drive fasteners into hard surfaces like steel and concrete

These tools are allowed with single or full sequential actuation only.

Contact force to operate the tool shall be 1,25 times or more of the tool weight including the maximum weight of the fasteners but minimum 50 N.

4.2.5.4 Permitted actuation modes for fastener driving tools without workpiece contact

— Single actuation

— Continual actuation

4.2.6 Strength of the fastener driving tool

4.2.6.1 Stress by compressed air for pneumatic tools

The pressurized section of pneumatic fastener driving tools shall be designed to withstand a minimum of 1,5 × $P_{S\ max}$ without any safety related failure.

4.2.6.2 Stress by mechanical impact

The fastener driving tool shall be so designed and constructed such that its safety functions are not compromised by rough handling or occasional dropping of the tool.

4.2.7 Surfaces, edges and corners

External surfaces of fastener driving tools, except if otherwise specifically designed, shall not have sharp edges or abrasive surfaces. It is intended to follow the technical principles and specifications which are outlined in ISO 12100.

4.2.8 Stability

Tools shall be so designed that they have a stable resting position on a horizontal, plane surface.

4.2.9 Tool construction

The tool shall be so designed and constructed such that its safety functions are not compromised by loosening or loss of components during use.

Tools designed to work with air pressure up to 12 bar shall use hose fittings with right-hand thread.

High pressure tools (above 12 bar) shall use hose fittings with left-hand thread.

4.2.10 Unintentional change of actuation mode

Tools with a workpiece contact and having an actuation mode selector shall be designed and constructed so that changes of the actuation mode shall be intentional and shall be clearly identifiable and visible to the operator. This can be achieved by many methods, such as:

a) two dissimilar actions being required to change modes, for example, buttons, sliding bars or levers;

b) protect and position the actuation mode selector outside the surface area grasped by the operator.

If the tool has an actuation mode selector, it shall be marked with the symbol D.1 (see Table D.1).

4.3 Electrical safety

Electrical circuits that carry voltage when the tool is in use or at rest shall be designed and insulated in such a way that the operator is protected from electric shock, and electrical arcing is prevented.

4.4 Thermal safety

4.4.1 Hot surfaces

Surface temperatures of parts of the tool which are held during use or could be inadvertently touched shall follow the provisions of ISO 13732-1.

4.4.2 Cold surfaces

Pneumatic fastener driving tools shall be designed in such a way that the surface temperature of handles does not fall by more than 5 K during operation of the fastener driving tool.

4.5 Noise reduction

The hand-held 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 the source. Principles for designing tools with reduced noise emission are contained in ISO/TR 11688-1 and ISO/TR 11688-2.

The noise emission from using fastener driving tools has two main sources:

— the hand-held tool itself;

— the workpiece.

Typical sources of noise emitted by the hand-held tool itself are:

— the motor and drive mechanism;

— the exhaust air or gases;

— vibration or impact-induced noise.

Measures to reduce noise produced by fastener driving tools include, for example, reducing the generation of noise by damping and, in the case of pneumatic fastener driving tools, by fitting an exhaust air damper. See ISO/TR 11688-1. The success of the applied noise reduction measures is assessed on the basis of the actual noise emission values (see 5.5) in relation to other machines of the same family.

NOTE Generally, noise emission from using fastener driving tools cannot be controlled by the manufacturer of the fastener driving tool. The noise at the point of action can also depend on the workpiece, working environment, the workpiece support, the number of driving operations and even regulation of the air pressure for pneumatic tools.

4.6 Mechanical impact (vibration/recoil)

The mechanical impacts such as vibration and recoil that are transmitted to the hand-arm system should be kept to a minimum during operation of fastener driving tools. Principles for designing tools with reduced vibration emission are contained in CR 1030-1.

Factors of influence include:

— design of fastener driving tools by

  — weight, and

  - driving velocity;
- handling process by
  - pressing effort,
  - hand gripping force depending on working direction,
  - adjustment of the energy supply (avoidance of excessive energy), and
  - frequency of operation;
- workpiece by
  - workpiece material (density, strength),
  - workpiece support, and
  - driving resistance of fasteners.

In the case of aperiodic impacts transmitted to the hand-arm system, these factors may exert a mutual influence on each other.

4.7 Materials and substances processed, used or emitted

4.7.1 Collating material residues

Fastener driving tools shall be designed in such a way that the free flight of collating material residues is restricted.

Tools which use fasteners with metal collating materials shall be guarded by any means, such as a plastic shroud, etc.

4.7.2 Discharged air, gas and lubricants

Discharged air, gas and lubricants emitted during operation of fastener driving tools shall be directed so that the user of the tool is not subjected to a safety hazard, either directly or indirectly, for example, as a result of dust being raised from the workpiece. This can be achieved by methods such as using exhaust deflectors on pneumatic tools.

For gas tools, a small release of exhaust gas will be generated by regular operations, which will be included in the operating instructions.

4.8 Ergonomics

4.8.1 Weight and control of the tool

4.8.1.1 Second handle

Fastener driving tools loaded with the maximum quantity and size of specified fasteners weighing more than 6 kg shall be supplied with a second handle which can be fitted by the user. The strength of a removable handle and the nature of fixing it shall be appropriate to the intended principal use. The additional handle shall be able to support the weight of the tool with maximum specified fasteners by a factor of 1,5. The additional handle shall be so designed to allow left-hand and right-hand operation.

4.8.1.2 Suspension device

Tools weighing more than 2,5 kg and used in a production environment shall be designed with provisions for mounting a suspension device such as a hanger. These provisions shall be able to support a weight of 1,5 times the weight of the tool, loaded with the maximum number and weight of fasteners.

NOTE The weight is measured without fasteners.

4.8.2 Handle design

To facilitate safe handling and operation of fastener driving tools, the tool handle shall be designed using ergonomic principles. As indicated in Annex E, in relation to ergonomic handle design, the following shall be considered:

— the space between the handle and the magazine shall be sufficient to accommodate the operator's grasp;

— the space between the handle and the magazine and the length of handle behind the trigger shall accommodate the wearing of work gloves;

— the handle and trigger shall have no operational preference to right-hand or left-hand operation.

To allow the picking up of the tool while moving between working areas without operating the trigger, the grasping length immediately behind the trigger shall be ≥74 mm (dimension L).

NOTE The ISO 7250 series has information regarding anthropometric measures for hand size, etc.

4.9 User information

4.9.1 Tool markings

The marking of a fastener driving tool shall be in accordance with 6.1.

4.9.2 Tool operating instructions

The operating instructions for a fastener driving tool shall be in accordance with 6.2.

4.10 Fire and explosion

4.10.1 Hazardous energy supplies for pneumatic tools

The operating instructions for pneumatic fastener driving tools shall warn against the use of

— oxygen, and

— other flammable gases.

4.10.2 Release of flammable gas from gas tools and gas containers

4.10.2.1 Gas containers

Gas containers shall pass manufacturing and filling examinations to avoid hazards due to leakage.

4.10.2.2 Gas container leakage

Maximum yearly leakage at +20 °C shall be less than 10 g for gas containers equipped with a metering valve or adapter if applicable.

4.10.2.3 Gas container connection to the tool

4.10.2.3.1 General

Connection between gas containers and tool shall be designed to avoid non-typical gas discharge for the following defined conditions:

4.10.2.3.2 Long-term connection leakage

For a tool at rest, the gas container shall have weight loss rates of less than 10 g on a monthly basis at +20 °C.

4.10.2.3.3 Short-term connection leakage

With the workpiece contact fully depressed, the gas container shall have weight loss rates of less than 1 g/h at +20 °C.

4.10.3 Rupture due to high temperatures in the tool

Gas containers, specified for a certain type of gas tools, shall withstand the pressure resulting from the maximum temperature, T_{max}, of +50 °C in the gas container chamber. The maximum pressure in the gas container, resulting from this maximum temperature, shall have a safety factor of 1,5 for the design of the gas container.

5 Verification

5.1 General

The tests detailed in 5.2 to 5.10 shall be carried out on new production sample(s).

5.2 Protection against mechanical hazards

5.2.1 Protection against points and edges of fasteners

A visual inspection shall be carried out to ascertain that points and edges of fasteners are protected.

5.2.2 Prevention of ejected fasteners

5.2.2.1 Connection to the energy supply system

5.2.2.1.1 General

For the tests in 5.2.2.1.2 and 5.2.2.1.3, energy supply is considered as:

— in the case of a pneumatic tool, compressed air at maximum stated operating pressure;

— in the case of a gas tool, full gas container and battery (if battery can be removed).

Both sequences of gas container and battery connection/disconnection have to be done according to 5.2.2.1.2 and 5.2.2.1.3.

5.2.2.1.2 Conformity on connection

a) The tool, with fasteners and workpiece contact and trigger not operated, shall be connected to the energy supply for a minimum 10 s.

b) The tool shall be then disconnected.

c) Steps a) and b) are repeated four additional times (for a total of five times).

d) During the test, no driving operation shall occur.

5.2.2.1.3 Conformity on disconnection

a) The tool with fasteners shall be connected to the energy.

b) The tool is then operated by driving at least one fastener and is then disconnected.

c) The tool shall then be operated normally in the correct sequence that would cause a driving operation if the tool was energized, and no driving operation shall occur.

d) Steps a), b) and c) are repeated four additional times (for a total of five times).

5.2.2.2 Prevention of accidental trigger operation

Functional testing is carried out to confirm that the trigger is fitted in such a manner that it cannot be operated unintentionally:

— in the case of a pneumatic tool, compressed air at maximum stated operating pressure;

— in the case of a gas tool, full gas container and battery (if battery can be removed).

For this purpose, the fastener driving tool is pushed and pulled a minimum of three times over a cylindrical obstacle of a maximum of 15 mm in diameter and minimum of 5 mm in height which is placed on a level surface. No unintentional driving operation shall occur during the tests.

A functional test is made to ascertain that the requirement set out under 4.2.2.2 is satisfied.

5.2.3 Prevention of free flight of fasteners

The fasteners are measured to establish whether a workpiece contact is required. The workpiece contact travel, before operation, is measured to ensure compliance with 4.2.3.

Functional testing to ensure compliance with 4.2.3.2.

Visual inspection to ensure compliance with 4.2.3.3.

Visual inspection to ensure compliance with 4.2.3.4.

Visual testing to ensure compliance with 4.2.3.5, and functional testing of the marked actuation systems to ensure fasteners are prevented from free flight.

5.2.4 Design of the workpiece contact

5.2.4.1 General

The dimensions of the workpiece contact shall be measured to ascertain whether the requirement is satisfied as set out under 4.2.4

5.2.4.2 Extended workpiece contact

Testing is carried out to ascertain whether a workpiece contact fitted is functionally safe in operation. The workpiece contact is operated five times in horizontal up, horizontal down and vertical positions and shall always return to its starting position.

Tools depending on compressed air for workpiece contact operation shall be tested at 80 % ±5 % $P_{s\,max}$.

5.2.4.3 Retracted workpiece contact

Functional testing is carried out to ascertain whether the tool meets the requirements in 4.2.4.2.

5.2.4.4 Intended resting position

The tool is loaded with the maximum mass of fasteners possible and is placed on a level surface in its normal resting position. A force of between 20 % and 25 % of the tool mass is applied to the top of the tool. The force is then removed and the tool is then raised by its trigger using a 12 mm (±0,5 mm) rod at the midpoint of the trigger, the time taken to fully depress the trigger shall not be less than 1 s. A means shall be provided to ensure that the tool does not tip laterally by more than 10° during the test. The tool shall not operate during the test. The tool mass is calculated using the tool mass without supply hose or fasteners. The pressure supplied to the tool shall be the minimum as specified in 6.4.1.

5.2.5 Actuation modes

5.2.5.1 Actuation modes for tools with an extended workpiece contact

Testing and measurement shall be conducted to ascertain whether the extended workpiece contact meets the operating force requirements of 4.2.5.1, Table 1. The tools shall be tested with the maximum mass of fasteners in 4.2.5.1 into a suitable solid wood, such as pine, at 80 % $P_{s\ max}$ ±5 %.

Tools with actuation mode selectors shall be evaluated in each possible actuation mode.

Tool actuation modes shall be evaluated as below in the horizontal-down, horizontal-up, and vertical orientations. The test conditions of this section are described using the horizontal-down orientation and shall be repeated for the horizontal-up and vertical tool orientations.

5.2.5.1.1 Full sequential actuation

a) Hold the tool in the horizontal-down orientation without touching the work surface.

b) Bring the tool into contact with the work surface, fully engaging the workpiece contact.

c) Operate the trigger (**a single driving operation shall occur**). Release the trigger.

d) Without moving the tool away from the work surface, operate and hold the trigger (**no driving operation shall occur**). Do not release the trigger.

e) While continuing to hold the trigger in the operating position, move the workpiece contact away from the work surface to allow the workpiece contact to fully disengage; then bring it back into contact with the work surface, fully engaging the workpiece contact (**no driving operation shall occur**).

f) Release the trigger and move the tool away from the work surface.

g) Repeat steps b) and c), where **a single driving operation shall occur** as described in step c).

For tools where the extended workpiece contact does not become fully disengaged when releasing the trigger, the test is repeated by continuing to hold the trigger and the extended workpiece contact is moved to contact the workpiece and no driving operation shall occur.

5.2.5.1.2 Single sequential actuation

a) Hold the tool in the horizontal-down orientation without touching the work surface.

b) Bring the tool into contact with the work surface, fully engaging the workpiece contact.

c) Operate the trigger (**a single driving operation shall occur**). Release the trigger.

d) Without moving the tool away from the work surface, operate and hold the trigger (**a single driving operation shall occur**).

e) While continuing to hold the trigger in the operating position, move the tool far enough from the work surface to allow the workpiece contact to fully disengage; then bring the tool into contact with the work surface so that the workpiece contact is fully engaged (**no driving operation shall occur**). Release the trigger.

5.2.5.1.3 Contact actuation

a) Hold the tool in the horizontal-down orientation without touching the work surface.

b) Operate the trigger (**no driving operation shall occur**).

c) While still holding the trigger, bring the tool into contact with the work surface, fully engaging the workpiece contact (**a single driving operation shall occur**). Release the trigger.

d) Without moving the tool away from the work surface, operate and hold the trigger (**a single driving operation shall occur**).

e) While continuing to hold the trigger in the operating position, move the tool from the work surface to allow the workpiece contact to fully disengage, then bring the tool into contact with the work surface, whereby the workpiece contact is fully engaged (**a single driving operation shall occur**). Release the trigger.

f) Move the tool away from the work surface. Hold the tool in the horizontal down orientation without touching the work surface.

g) Bring the tool into contact with the work surface. No driving operation shall occur.

5.2.5.1.3.1 Contact actuation with automatic reversion

a) Verification of time-out or reversion with contact actuation first

1) Hold the tool in the horizontal-down orientation without touching the work surface.

2) Press the trigger.

3) Then within a time MORE than specified by the manufacturers' instructions, bring the tool into contact with the work surface, fully engaging the workpiece contact (**no driving operation shall occur**).

4) Disengage the workpiece contact from the work surface and release the trigger.

5) Press the trigger. Keeping the trigger pressed, bring the tool into contact with the work surface, fully engaging the workpiece contact within a time LESS than specified by the manufacturers' instructions (**a driving operation shall occur**), each time the workpiece contact is fully engaged with the work surface within a time less than specified by the manufacturers' instructions.

6) Keeping the trigger pressed, disengage the workpiece contact from the work surface and wait for MORE than the time specified by the manufacturers' instructions. Bring the tool into contact with the work surface, fully engaging the workpiece contact (**no driving operation shall occur**).

7) Release trigger and disengage the workpiece contact.

8) Repeat five times.

b) Verification of time-out or reversion with sequential first

1) Hold the tool in the horizontal-down orientation without touching the work surface. Press the trigger and fully engage the workpiece contact (**no driving operation shall occur at any time**).

2) Release the trigger and disengage the workpiece contact.

3) Hold the tool in the horizontal-down orientation without touching the work surface.

4) Fully engage the workpiece contact with the work surface.

5) Press the trigger (**a single driving operation shall occur**).

6) Keeping the trigger pressed, bring the tool into contact with the work surface, fully engaging the workpiece contact within a time LESS than specified by the manufacturers' instructions (**a driving operation shall occur**), each time the workpiece contact is fully engaged with the work surface within a time less than specified by the manufacturers' instructions.

7) Disengage the workpiece contact from the work surface and release the trigger.

5.2.5.1.4 Continual contact actuation

a) Hold the tool in the horizontal-down orientation without touching the work surface.

b) Bring the tool into contact with the work surface, fully engaging the workpiece contact.

c) Operate and hold the trigger [**driving operation(s) shall occur**]. Release the trigger [**driving operation(s) shall stop**].

d) While holding the tool in the same orientation and with the workpiece contact (if so equipped) fully engaged on the work surface, operate and hold the trigger [**driving operation(s) shall occur**]. While continuing to hold the trigger in the operating position, move the tool from the work surface so that the workpiece contact (if so equipped) can fully disengage [**driving operation(s) shall stop**]. Release the trigger.

5.2.5.2 Application and utility

Functional testing, measurement and inspection are carried out to ascertain whether the tool meets the requirements in 4.2.5.2.

5.2.5.3 Actuation modes for tools with a workpiece contact designed to normally push against hard surfaces like steel and concrete

Full sequential actuation for tools designed to drive fasteners into hard surfaces such as steel and concrete shall comply with the appropriate tests in 5.2.5.1.1

Single sequential actuation for tools designed to drive fasteners into hard surfaces such as steel and concrete shall comply with the appropriate tests in 5.2.5.1.2

5.2.5.4 Actuation modes for tools without a workpiece contact

Functional testing is carried out to ascertain whether the actuation mode of the tool meets the requirements in 4.2.5.4.

5.2.6 Strength of the fastener driving tool

5.2.6.1 Stress by compressed air for pneumatic tools

A pressure/leak test is carried out over a period of 120 s of at least 1,5 × ($P_{s\,max}$) + 5 % – 0 %.

Leakage losses through the seals do not constitute a failure.

5.2.6.2 Stress by mechanical impact

Compliance with 4.2.6.2 shall be verified by dropping a sample tool three times onto a concrete surface from a height of 1 m. No failures that result in an unsafe operating condition shall occur. The sample shall be positioned to vary the point of impact.

No failures that result in an unsafe operating condition shall occur by repeating the relevant tests of 5.2.2 to 5.2.10 and 5.10.2.3.

Leakage losses through the seals do not constitute a failure.

5.2.7 Surfaces, edges and corners

A visual inspection shall be carried out to ascertain that the requirements under 4.2.7 are satisfied.

5.2.8 Stability

Functional testing shall be carried out to ascertain whether the tool remains in a stable position on a horizontal, plane surface. For pneumatic tools, the hose shall be connected. The tool shall remain stable in at least one position. The manufacturer shall identify suitable positions in accordance with 6.2.2.4.

5.2.9 Tool construction

If operated without fasteners, it is conducted at the lowest recommended operating pressure.

If operated with fasteners, the fasteners shall be the minimum size recommended for the tool, at $P_{s\ max}$ and using suitable material.

No failures that result in an unsafe operating condition shall occur.

During the course of the test, normal cleaning, maintenance and cooling operations shall be allowed.

NOTE Pressure requirements only apply to pneumatic tools.

Inspection and test is required to ensure correct threads are fitted.

5.2.10 Unintentional change of actuation mode

Tools with actuation mode selectors shall be tested to ensure compliance with 4.2.10.

5.3 Electrical safety

For pneumatic tools, a functional test is made to ascertain that the requirement set out under 4.3 is satisfied.

In the case of gas fastener driving tools, functional tests are made to ascertain that the requirement set out under 4.3 is satisfied.

Three functional tests are conducted to verify that electrical shock and arcing do not occur.

a) Operate the gas tool with the battery installed and visually observe that no arcing occurs.

b) Shock hazard shall be evaluated by visual inspection for accessible points of electrical contact with the operator's hand or fingers during operation.

c) A visual and functional test shall be made to ensure that the designed battery cannot be installed with reversed polarity.

5.4 Thermal safety

5.4.1 Hot surfaces

An examination shall be carried out to confirm that the surface temperature on parts of the fastener driving tools which can be touched by the operator during operation do not exceed the limit values set out in ISO 13732-1.

The fastener driving tool shall be brought up to a surface temperature of 20 °C ±2 °C prior to carrying out the measurements. The fastener driving tool shall be operated for a period of 5 min with 12 driving operations per minute, and the surface temperatures thus produced measured in accordance with ISO 13732-1.

5.4.2 Cold surfaces

In the case of pneumatic tools, an examination is to be carried out to confirm that the surface temperature of the grasping surface of the handles does not fall by more than 5 K during operation.

a) The surface temperatures of the handles of the fastener driving tool are measured and recorded as initial values.

b) The fastener driving tool is operated for a period of 5 min at a frequency of 12 operations per minute.

c) The resultant surface temperatures are thereafter measured and recorded as final values.

The requirement is satisfied if the following condition is fulfilled:

initial temperature value − final temperature value ≤5 K

The surface temperature measurements shall be carried out in accordance with ISO 13732-3.

During this procedure, the supplied compressed air shall exhibit a temperature conforming to the initial values of the handles of the tool.

5.5 Noise

Noise emission values shall be measured and reported in accordance with EN 12549 for fastener driving tools designed to drive fasteners into wood. For tools with workpiece contacts designed to normally push against hard surfaces like steel or concrete, the noise emission values shall be measured and reported in accordance with EN 15895:2011, Annex D. The noise emission values, and their uncertainties, shall be declared as a dual number declaration in accordance with ISO 4871.

5.6 Mechanical impact (vibration/recoil)

The vibration total value shall be measured and reported in accordance with ISO 8662-11:1999 and ISO 8662-11:1999/Amd 1:2001.

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

5.7 Materials and substances processed, used or emitted

5.7.1 Collating material residues

A visual test shall be carried out to confirm that tools which use fasteners with metal collating materials are fitted with a shield, to ascertain that the requirements of 4.7.1 are satisfied.

5.7.2 Discharged air, gas and lubricants

Functional testing shall be carried out to ensure compliance with 4.7.2.

Check that information about small releases of gas generated by regular operations is in the operating instructions under 6.2.4.

5.8 Ergonomics

5.8.1 Weight and control of the tool

The weight of the tool, loaded with the maximum quantity and size of specified fasteners, shall be determined.

5.8.1.1 Second handle

The second handle shall be loaded to a force 1,5 times the reference weight, to confirm compliance with 4.8.1.1.

5.8.1.2 Suspension device

If tools are provided with a provision, such as a hanger for a suspension device, the provisions are subjected to a force 1,5 times the weight of the tool for 5 min. After 5 min, the provision shall remain intact and show no permanent deformation.

5.8.2 Handle design

The requirements shall be verified.

5.9 User information

5.9.1 Tool marking

Tools shall be visually inspected to determine whether the information required by ISO 12100 and 6.1 has been applied to the fastener driving tool in a durable manner and in a clearly visible form. A comparison is undertaken to ascertain whether this data corresponds with the information given in the operating instructions.

5.9.2 Tool operating instructions

A visual inspection is carried out to ascertain whether operating instructions are available and if the requirements of 6.3 are satisfied.

5.10 Fire and explosion

5.10.1 Hazardous energy supplies for pneumatic tools

Verify that the operating instructions for pneumatic tools contain a clear warning prohibiting the use of oxygen and flammable gases.

5.10.2 Release of flammable gas from gas tools and gas containers

5.10.2.1 Gas containers

Verify that gas container manufacturing and filling tests comply with the relevant regulations and standards in the market to which gas containers are brought. Examples of standards and regulations are listed in the Bibliography.

5.10.2.2 Gas container leakage

The maximum yearly leakage for ready-to-use gas container shall be measured by performing the following test:

a) Select a batch of at least five full gas container specimens.

b) Mount metering valves or adaptors, if applicable, onto the gas containers.

c) Thermally calibrate the gas containers to +20 °C.

d) Weigh each gas container.

e) Let the gas containers rest at least 7 days, with rest time measured.

f) Weigh gas containers then calculate yearly leakage (365 days basis).

Test is passed if no specimen leaks more than 10 g on a yearly basis.

5.10.2.3 Gas container connection to the tool

5.10.2.3.1 Long-term connection leakage

Long-term connection leakage between the gas container and the tool shall be assessed.

Before conducting a long-term connection leakage test, measure the installation gas leakage first by following these steps:

— Weigh one full gas container then install it in the tool.

— Within 30 s, remove the gas container from the tool then weigh it.

— Calculate weight loss.

— Repeat this test with four other gas containers.

The installation gas leakage is the average weight loss of the five tests.

To measure the long-term connection leakage between the gas container and the tool, perform the following test:

a) Select a batch of at least five full gas container specimens and five tools.

b) Mount metering valves or adaptors, if applicable, onto the gas containers.

c) Thermally equilibrate the batch of gas containers and tools at +20 °C.

d) Weigh the gas containers.

e) Insert the gas containers into the tools.

f) Let the tool rest undisturbed for at least 7 days at 20 °C ±1 °C.

g) Remove the gas containers from the tools.

h) Weigh each gas container, then deduct the installation gas leakage as previously measured.

i) Calculate the monthly leakage (30 days basis).

The test is passed if no specimen leaks more than 10 g on a monthly basis.

5.10.2.3.2 Short-term connection leakage

The short-term connection leakage between the gas container and the tool shall be assessed.

Before conducting a short-term connection leakage test, measure first the installation gas leakage as described in 5.10.2.3.1.

To measure the short-term connection leakage between the gas container and the tool, perform the following test:

a) Select a batch of at least five full gas container specimens and five tools.

b) Mount metering valves or adaptors, if applicable, onto the gas containers.

c) Thermally equilibrate the batch of gas containers and tools at +20 °C.

d) Weigh the gas containers.

e) Insert the gas containers into the tools.

f) Fully engage the workpiece contact and keep it engaged for a period of 6 h.

g) Remove the gas containers from the tools.

h) Weigh the gas containers, then deduct the installation gas leakage previously measured.

i) Calculate hourly leakage (1 h basis).

The test is passed if no specimen leaks more than 1 g on an hourly basis.

5.10.3 Rupture test for gas containers at high temperature

The high-temperature safety of the gas containers shall comply with the following tests.

5.10.3.1 Safety factor test

a) Read the maximum temperature, T_{max}, in the gas container compartment of the tool from the tool's operator's handbook. If T_{max} is not declared, use the standard value T_{max} = +50 °C.

b) Determine the pressure, P_{max}, in the gas container resulting from the temperature, T_{max}.

c) Select a batch of five gas container specimens before they get filled with gas. This test procedure requires gas containers without containing gas.

d) Keep the test specimens stable at room temperature.

e) Apply hydraulic pressure to each gas container either by water or oil.

f) Increase pressure until the gas containers burst. Pressure increase rate shall remain smaller than 2 bar/s.

g) Measure the pressure causing the gas container to burst (P_{burst}).

The test is passed if all five gas containers tested have a P_{burst} greater than 1,5 times their P_{max}.

5.10.3.2 Long term test at T_{max}

a) Select five full gas container specimens.

b) Set up metering valve or adapter, if applicable.

c) Heat the test specimens to the temperature T_{max}, e.g. by putting them into a water bath.

d) Keep the test specimens stable at the temperature T_{max} for 30 min.

The tested gas containers shall not show any permanent deformations or signs of leakage.

5.11 Structure of verification

Table 2 — Structure of verification

Safety requirement	Visual check	Functional check	Measurement	Reference to clauses of this document or to other standards
4.2.1 Protection against points and edges of fasteners	X			5.2.1
4.2.2 Prevention of unintended ejection of fasteners				
4.2.2.1 Energy supply system		X		5.2.2.1.2 and 5.2.2.1.3
4.2.2.2 Accidental trigger operation		X	X	5.2.2.2
4.2.3 Prevention of free flight of fasteners			X	5.2.3
4.2.4 Design of the workpiece contact		X	X	5.2.4, 5.2.4.2 and 5.2.4.3
4.2.5 Permitted trigger actuation modes		X	X	5.2.5.1 and 5.2.5.2
4.2.6 Strength of the fastener driving tool				
4.2.6.1 Stress by compressed air	X	X	X	5.2.6.1
4.2.6.2 Stress by mechanical impact	X	X		5.2.6.2
4.2.7 surfaces, edges and corners	X			5.2.7
4.2.8 Stability		X		5.2.8
4.2.9 Tool construction		X		5.2.9
4.2.10 Unintentional change of actuation mode	X	X		5.2.10
4.3 Electrical safety	X	X		5.3
4.4 Thermal safety				
4.4.1 Hot surfaces		X	X	5.4.1 and ISO 13732-1
4.4.2 Cold surfaces		X	X	5.4.2 and ISO 13732-3
4.5 Noise reduction			X	5.5 EN 12549 ISO 4871 EN 15895
4.6 Mechanical impact (vibration/recoil)			X	5.6 EN 12096 ISO 8662-11:1999 ISO 8662-11:1999/ Amd 1:2001
4.7 Materials and substances processed, used or exhausted				
4.7.1 Collating material residues	X			5.7.1
4.7.2 Discharged air, gas and lubricants		X		5.7.2
4.8 Ergonomics				
4.8.1 Weight and control of the tool			X	5.8.1
4.8.1.1 Second handle	X	X	X	5.8.1.1
4.8.1.2 Suspension device	X	X	X	5.8.1.2
4.8.2 Handle design		X	X	5.8.2

Table 2 *(continued)*

Safety requirement	Visual check	Functional check	Measurement	Reference to clauses of this document or to other standards
4.9 User information				
4.9.1 Tool marking	X			5.9.1
4.9.2 Tool operating instructions	X			5.9.2
4.10 Fire and explosion				
4.10.1 Hazardous energy supplies for pneumatic tools	X			5.10.1
4.10.2 Release of flammable gas from gas tools and gas containers				
4.10.2.1 Gas containers	X			5.10.2.1
4.10.2.2 Gas container leakage		X	X	5.10.2.2
4.10.2.3 Gas container connection to the tool		X	X	5.10.2.3
4.10.2.3.2 Long-term connection leakage		X	X	5.10.2.3.1
4.10.2.3.3 Short-term connection leakage		X	X	5.10.2.3.2
4.10.3 Rupture due to high temperatures in the tool				5.10.3

6 Information for use

6.1 Markings

— Fastener driving tools shall be marked visibly, legibly and indelibly. Markings shall be located to withstand normal wear and tear throughout the expected life of the tool with the following information:

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

  NOTE 1 The address can be simplified if there is insufficient room on small machines, as long as the manufacturer (and, where applicable, his authorized representative) can always be identified. In any event, the address on the plaque should be sufficient for mail 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, date code or batch number;

  — year of manufacture (may be part of the serial number, date code or batch number);

  — in the case of pneumatic fastener driving tools, the maximum operating pressure, $P_{s\ max}$, in common units such as bar or psi shall be indicated on the tool;

  — specification of the fasteners which can be used shall include minimum and maximum diameter, length, and fastener characteristics, such as gauge and angle.

— Fastener driving tools shall be permanently marked with the following symbols (see Annex C):

  — C.1, showing that the operating instructions shall be read before work starts;

  — C.2, requiring operators and others in the work area to wear eye protection;

— C.3, requiring operators and others in the work area to wear hearing protection.

— Interchangeable magazines shall be marked on the magazine (if the magazine changes the recommended fasteners for the product) in such a way that the appropriate fasteners can be identified.

— Gas containers shall be clearly marked with the gas tools for which they are designed.

6.2 Instruction handbook

6.2.1 General

The information to be provided to the user, the content of this clause, together with ISO 12100:2010, 6.4.5.2 and 6.4.5.3, shall apply.

The information provided by the manufacturer is an important but not exclusive basis for safe use of the tool. It should provide sufficient information for the end user to perform an initial risk assessment.

The hazards identified in 6.2.2.5 to 6.2.2.12 are foreseeable in the general use of hand-held tools. The information provided with the tool shall state that the user should assess the specific risks that may be present as a result of each use.

Each fastener driving tool shall be accompanied by operating instructions drawn up by the manufacturer or his authorized representative in one of the official languages of the country of sale, which shall contain the following information:

— name and address of the manufacturer or supplier or any other agent responsible for placing the tool on the market;

— designation of the machinery;

— designation of the series or type;

— information stating whether the tool is designed to drive fasteners into hard surfaces like steel and concrete;

— information on noise emission as stated in 6.2.2.12 and 6.4.2.1;

— information on vibration emission; see 6.2.2.12;

— maintenance instructions; see 6.5;

— explanations of the symbols (described in Annexes C and D) marked on the tool;

— designation of the resources to be used (energy supply system, lubricants);

— correct mode of connection to the energy supply system;

— safe handling;

— action to be taken in the event of operational difficulties such as jamming and rectification of such difficulties;

— diagrammatic drawing showing the construction of the fastener driving tool;

6.2.2 Operator's instructions

6.2.2.1 General

The instructions and warnings stated below shall be given with all fastener driving tools unless the risk assessment shows that they are not relevant to a particular fastener driving tool. Words of equivalent meaning may be used.

6.2.2.2 Statement of use

The operator's instruction shall include a description of the correct use of the tool. The operator's instruction shall state that any other use is forbidden. Fastener driving tools with continual contact actuation or contact actuation shall only be used for **production applications**.

6.2.2.3 Allowance for user

The operator's instruction shall be written to cover professional and non- professional users.

6.2.2.4 General safety rules

Warnings shall be given with regards to significant hazards arising from or associated with the use of the fastener driving tools. The following is a non-exhaustive list of warnings. Manufacturers may provide additional warnings:

— Keep fingers away from trigger when not operating this tool and when moving from one operating position to another.

— Multiple hazards. Read and understand the safety instructions before connecting, disconnecting, loading, operating, maintaining, changing accessories on, or working near the tool. Failure to do so can result in serious bodily injury.

— Keep all body parts such as hands and legs, etc. away from firing direction and ensure fastener cannot penetrate workpiece into parts of the body.

— When using the tool, be aware that the fastener could deflect and cause injury.

— Hold the tool with a firm grasp and be prepared to manage recoil.

— Only technically skilled operators should use the fastener driving tool.

— Do not modify the fastener driving tool. Modifications may reduce the effectiveness of safety measures and increase the risks to the operator and/or bystander.

— Information for tools intended to be used on hard surfaces such as steel and concrete regarding the additional downforce required to operate the tool and prevent slipping.

— Do not discard the safety instructions.

— Do not use a tool if the tool has been damaged.

— Be careful when handling fasteners, especially when loading and unloading, as the fasteners have sharp points which could cause injury.

— Always check the tool before use for broken, misconnected or worn parts.

— Do not overreach. Only use in a safe working place. Keep proper footing and balance at all times.

— Keep bystanders away (when working in an area where there is a likelihood of through traffic of people). Clearly mark off your operating area.

— Never point the tool at yourself or others.

— Only wear gloves that provide adequate feel and safe control of triggers and any adjusting devices.

— Always use the second handle (if supplied).

The tool's resting position shall be specified.

6.2.2.5 Projectile hazards

The following apply:

— The fastener driving tool shall be disconnected when unloading fasteners, making adjustments, clearing jams or changing accessories.

— During operation be careful that fasteners penetrate material correctly and cannot be deflected/misfired towards operator and/or any bystanders.

— During operation, debris from workpiece and fastening/collation system may be discharged.

— Always wear impact-resistant eye protection with side shields during operation of the tool.

— The risks to others shall be assessed by the operator.

— Be careful with tools without workpiece contact as they can be fired unintentionally and injure operator and/or bystander.

— Ensure tool is always safely engaged on the workpiece and cannot slip

6.2.2.6 Operating hazards

The following apply:

— Hold the tool correctly: be ready to counteract normal or sudden movements such as recoil.

— Maintain a balanced body position and secure footing.

— Appropriate safety glasses shall be used and appropriate gloves and protective clothing are recommended.

— Appropriate hearing protection shall be worn.

— Use the correct energy supply as directed in the manual.

— Operating instructions shall direct the user on appropriate uses of the tool. This shall include information on what applications are allowed and which are not, and the associated risks such as when working on the back of trucks and moving platforms, etc.

— Operating instructions shall warn about risks associated with selective actuation.

6.2.2.7 Repetitive motions hazards

When using a tool for long periods, the operator may experience discomfort in the hands, arms, shoulders, neck, or other parts of the body.

The following apply:

— While using a tool, the operator shall adopt a suitable but ergonomic posture. Maintain secure footing and avoid awkward or off-balanced postures.

— If the operator experiences symptoms such as persistent or recurring discomfort, pain, throbbing, aching, tingling, numbness, burning sensation, or stiffness, do not ignore these warning signs. The operator shall consult a qualified health professional regarding overall activities.

— Information shall be provided by the manufacturer regarding residual risks relating to repetitive work hazards such as duration of use in respect to working positions and forces such information can be found in EN 1005–3 and EN 1005–4.

— Any risk assessment should focus on muscular-skeletal disorders and is preferentially based on the assumption that decreasing fatigue during work is effective in reducing disorders.

6.2.2.8 Accessory and consumable hazards

The following apply:

— The operating instructions shall specify the appropriate accessories and consumables.

— Disconnect the energy supply to the tool, such as air or gas or battery as applicable, before changing/replacing accessories such as workpiece contact, or making any adjustments.

— Use only the sizes and types of accessories that are provided by the manufacturer.

— Use only lubricants recommended by the tool manufacturer.

— Specification of the fasteners which can be used shall include minimum and maximum diameter, length, and fastener characteristics, such as gauge and angle.

6.2.2.9 Workplace hazards

The following apply:

— 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 airline hose.

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

— This tool is not intended for use in potentially explosive atmospheres and is not insulated from coming into contact with electric power.

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

6.2.2.10 Dust and exhaust hazards

If the tool is used in an area where there is static dust, it may disturb the dust and cause a hazard. The following apply:

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

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

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

6.2.2.11 Noise hazards

The information for use shall give the following information and warnings:

— Unprotected 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).

— 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 appropriate hearing protection.

— Operate and maintain the tool as recommended in these instructions, to prevent an unnecessary increase in noise levels.

— If the tool has a silencer, always ensure it is in place and in good working order when the tool is being operated.

NOTE 1 These values are tool-related characteristic values and do not represent the noise generation at the point of use. Noise at the point of use will for example depend on the working environment, the workpiece, the workpiece support, and the number of driving operations.

In addition, reference should be made to noise reduction measures.

NOTE 2 Workplace design can also serve to reduce noise levels, for example placing workpieces on sound-damping supports (see also ISO 11690-1).

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 risk. 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 8662-11:1999 and ISO 8662-11:1999/Amd 1:2001 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.

NOTE The vibration emission value above is a tool-related characteristic value and does not represent the influence to the hand-arm-system when using the tool. Any influence to the hand-arm-system when using the tool will for example depend on the gripping force, the contact pressure force, the working direction, the adjustment of energy supply, the workpiece, the workpiece support.

The following warnings, or equivalent, shall be given:

— Information to conduct a risk assessment of these hazards and implementation of appropriate controls is essential.

— 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, keep your hands warm and dry.

— If you experience numbness, tingling, pain or whitening of the skin in your fingers or hands, seek medical advice from a qualified occupational health professional regarding overall activities.

— Operate and maintain the tool as recommended in these instructions, to prevent an unnecessary increase in vibration levels.

— Hold the tool with a light, but safe, grip because the risk from vibration is generally greater when the grip force is higher.

6.2.3 Additional safety instructions for pneumatic tools

The following additional warnings (or equivalent) shall be given with all pneumatic fastener driving tools:

— Compressed air can cause severe injury.

— Always shut off air supply, and disconnect tool from air supply when not in use.

— Always disconnect the tool from the compressed air supply before changing accessories, making adjustments and/or repairs, when moving away from an operating area to a different area.

— Keep fingers away from trigger when not operating the tool and when moving from one operating position to another.

— Never direct compressed air at yourself or anyone else.

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

— Never carry a pneumatic tool by its hose.

— Never drag a pneumatic tool by its hose.

— When using pneumatic tools, do not exceed the maximum operating pressure $P_{s\,max}$.

— Pneumatic tools should only be powered by compressed air at the lowest pressure required for the work process to reduce noise and vibration, and minimize wear.

— Using oxygen or combustible gases for operating pneumatic tools creates a fire and explosion hazard.

— Be careful when using pneumatic tools as the tool could become cold, affecting grip and control.

6.2.4 Additional safety instructions for gas tools

The following additional warnings (or equivalent) shall be given with all gas tools:

— Gas tools shall only be used with gas containers which are listed in the operating instructions of the tool, or which have been tested according to ISO 11148-13 by the gas container supplier.

— Be careful when using gas tools, as the tool can become hot, affecting grip and control.

— Gas fastener driving tools shall be used in ventilated spaces.

— In the case that liquid combustible gas comes into contact with human skin, injuries may occur.

— Gas containers shall be marked according to the required transport regulation.

— Handle gas containers carefully and check for damages. Damaged gas containers can explode and cause injury.

— Read and follow the instructions supplied with the gas container.

— Ensure combustible materials are not exposed to hot exhaust gases.

— Do not use gas tools in explosive areas as the sparks generated in the tool may cause fire or explosion.

— The operating instructions for gas tools shall warn against careless storage, high temperature, handling and disposal of gas containers and batteries or accumulators.

— For gas tools, a small release of gas might be generated by regular operations.

6.2.5 Specific safety instructions

Warnings shall be given about any specific or unusual hazards associated with the use of the 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 operating instructions shall include the following where appropriate:

— assembly instructions, including recommended guards and accessories;

— illustrated description of functions;

— limitations on tool use by environmental conditions;

— instructions for setting and testing;

— general instructions for use, accessories and limits on the type of workpiece;

— for tools with contact actuation with automatic reversion, information on how it works, such as sequence and any time limitations, taking into consideration health and safety precautions when operating.

6.4 Data

6.4.1 General

The instructions shall include the information on the tool and the following:

— mass of the fastener driving tool in kg;

— in the case of pneumatic tools, the minimum and maximum operating pressures.

6.4.2 Noise

6.4.2.1 Declaration of emission

The instructions shall include the noise-emission values and uncertainties as specified in 4.5 and the reference number of the test codes, EN 15895 and EN 12549.

The technical sales literature of fastener driving tools shall contain the same noise emission declaration as the instructions.

6.4.2.2 Additional information

If the values for noise emissions obtained using the appropriate tests defined in 5.5 do not adequately represent the emissions during the intended use of the machine, additional information and/or warnings shall be supplied to enable an assessment and the management of the associated risks.

6.4.3 Mechanical impact (vibration/recoil)

6.4.3.1 Declaration of emission

The instructions shall include the emission values and uncertainty as specified in 5.6 and the reference number of the test code, ISO 8662-11:1999 and ISO 8662-11:1999/Amd 1:2001 as applicable.

If the vibration value exceeds 2,5 m/s^2, the average hand-arm vibration value shall be declared with uncertainty.

If the emission value does not exceed 2,5 m/s^2, this shall be mentioned.

6.4.3.2 Additional information

If the vibration-emission values obtained using the appropriate tests defined in 5.6 do not adequately represent the emissions during the intended use of the machine, additional information and/or warnings shall be supplied to enable an assessment and the management of the associated risks.

Tools that produce recoil shall be supplied with information regarding continuous use, such as repetitive strain injury.

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

6.5 Maintenance instructions

The maintenance instructions shall contain:

— instruction to keep the tools safe by regular maintenance;

— information on when, and instructions on how, any maintenance shall be carried out; for instance, after a specified time of operation, a specified number of cycles/operations, a stated number of times per year;

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

— a list of the service operations that the user shall carry out;

— instructions for lubrication, if required;

— for the maintenance of fastener driving tools, only spare parts specified by the manufacturer or his authorized representative shall be used;

— repairs shall be carried out only by agents authorized by the manufacturer having due regard to the information given in the operating instructions.