SLOVENSKI STANDARD
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Hand-held non-electric power tools - Safety requirements - Part 13: Fastener driving tools

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Handgehaltene nicht-elektrisch betriebene Maschinen - Sicherheitsanforderungen - Teil 13: Eintreibgeräte

Machines portatives a moteur non électrique - Prescriptions de sécurité - Partie 13: Machines a enfoncer les fixations

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 255 "Hand-held, non-electric power tools - Safety", the secretariat of which is held by SIS.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2000, and conflicting national standards shall be withdrawn at the latest by December 2000

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

This European Standard has been drawn up in co-operation with representatives of the manufacturers and users of fastener driving tools and the health and safety authorities.

Normative and informative annexes to this standard are indicated in the contents list.

0 Introduction

This standard has been drawn up to serve as a harmonised standard which represents one means of achieving conformity with the fundamental safety requirements of the EC Machinery Directive and associated EFTA Regulations.

The extent to which hazards are covered is indicated in the scope of this standard. In addition, machinery should comply as appropriate with EN 292 for hazards which are not covered by this standard.

1 Scope

This standard is applicable to fastener driving tools which are handled by one person and in which energy in a linear movement is applied to a loaded fastener for the purpose of driving this into a workpiece of a determined material. During the driving operation, the fastener leaves the tool partially or entirely, with sufficient velocity to overcome the resistance of penetration, and forms a mechanical connection or attachment of different workpieces. The energy required for driving a fastener is provided by compressed air or combustible gases.

NOTE 1:Fastener driving tools are also referred to for example as Nailers, Staplers, Tackers, Pinners.

NOTE 2:The workpiece material can, for example, consist of wood, wooden materials, plastic material, fibre materials - loose or condensed, cement- and lime materials, metal.

This standard contains requirements for the design, marking and information for use of fastener driving tools, corresponding to the specific hazards listed in clause 4. The standard sets out the means of verification for these requirements.

Where, for clarity, an example of a safety measure is given in the text, this shall not be considered as the only possible solution. Any other solution leading to the same risk reduction is permissible if an equivalent level of safety is achieved.

This standard is applicable to fastener driving tools which have been produced after the date of publication of the standard.

This standard is not applicable to stapling pliers and vibration hammers.

NOTE 3: "Stapling pliers" are handheld power operated tools equipped with a fixed or moving anvil bar in front of the muzzle, which are used predominantly for joining paper, leather, textiles and similar materials.

This standard is not applicable to fastener driving tools in which the energy for driving fasteners is drawn from cartridges or from any type of electric supply.

2 Normative references

This European Standard incorporates, by dated or undated references, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications form part of this European Standard only when incorporated therein by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 292-1	Safety of machinery - Basic concepts, general principles for design - Part 1 : Basic terminology, methodology
EN 292-2	Safety of machinery - Basic concepts, general principles of design – Part 2 : Technical principles and specifications
EN 349	Safety of machinery - Minimum gaps to avoid crushing of parts of the human body
EN 563	Safety of machinery - Temperatures of touchable surfaces - Ergonomics data to establish temperature limit values for hot surfaces
EN 614-1	Safety of machinery - Ergonomic design principles - Part 1: Terminology and general principles
EN ISO 4871	Acoustics - Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)
EN ISO 11688-1	Acoustics – Recommended practice for the design of low-noise machinery and equipment – Part 1:Planning (ISO/TR 11688-1:1995)
EN ISO11690-1	Acoustics – Recommended practice for the design of low-noise workplaces containing machinery – Part 1:Noise control strategies (ISO 11690-1:1996)
EN 12096	Mechanical vibration - Declaration and verification of vibration emission values
EN 12549:1999	Acoustics - Noise test code for fastener driving tools - Engineering method
EN 50144-1	Safety of handheld motor-operated electric tools - Part 1: General requirements
ISO 8662-11:1999	Hand-held portable power tools - Measurement of vibration at the handle Part 11: Fastener driving tools

3 Definitions

The following definitions are applicable for the purpose of this standard:

3.1 fastener driving tool: A handheld power tool in which energy is applied in a linear movement to a loaded fastener for the purpose of driving the latter into defined materials. During the driving operation, the fastener leaves the tool partially or scompletely. The tool may be fitted with a single-, sequential-, contact- or continuous release system and operated in accordance therewith. The energy required for driving operation is drawn from compressed air, combustible gases, or any other source whose energy can be stored inside the fastener driving tool and released as required.

3.2 fastener: The concept "fastener" comprises nails, staples, pins, corrugated fasteners, screws used as nails, dowels, sleeves, bushes, cable collars and base supports.

3.3 collating material: Material for joining together single fasteners in strips or coils with e.g. lacquer, paper or plastic tape, plastic strap or wire.

3.4 trigger: Component part of the fastener driving tool used to supply energy to the driving mechanism.

3.5 safety yoke: Mechanism with a workpiece contact element in the muzzle area which prevents the tool from driving a fastener if it is not pressed against the workpiece (See figure 1)

3.6 actuating systems

3.6.1 actuating systems on fastener driving tools with a safety yoke

3.6.1.1 single sequential actuation: An actuating system in which the trigger and the safety yoke have to be operated so that only one single driving operation is actuated via the trigger after the muzzle of the tool has been applied to the driving location. Thereafter further driving operations can only be performed after the trigger has been returned to the non driving position whilst the safety yoke remains depressed.

3.6.1.2 full sequential actuation: An actuating system in which the trigger and the safety yoke have to be interconnected so that only one single driving operation is actuated via the trigger after the muzzle of the tool has been applied to the driving location. Thereafter further driving operations can only be performed if the trigger and the safety yoke have first been returned to the non driving position.

3.6.1.3 contact actuation: An actuating system in which the trigger and the safety yoke have to be actuated for each driving operation, with the order of actuation not being specified. For repeated driving operations, it is sufficient that either the trigger remains activated and the safety yoke is activated thereafter, or vice versa.

3.6.1.4 continuous contact actuation: An actuating system in which the trigger and the safety yoke have to be actuated, with the order of actuation not being specified. The driving operations continue as long as the trigger and the safety yoke remain actuated.

3.6.2 actuating systems on fastener driving tools without safety yoke

3.6.2.1 single actuation: An actuating system in which the trigger has to be actuated for each driving operation.

3.6.2.2 continuous actuation: An actuating system in which the driving operations are carried out for as long as the trigger remains actuated.

3.7 dispenser for combustible gas: Non-reusable container made of metal, glass or plastic and containing a combustible gas compressed or liquefied and fitted with a release device allowing the content to be ejected.

NOTE: Dispenser for combustible gas are also referred to for example as aerosol dispenser, flammable gas container or gas cartridge.

3.8 Nomenclature

1 Safety yoke
Palpeur de sécurité
Auslösesicherung

2 Bumper
Amortisseur
Puffer

3 Cylinder
Cylindre
Zylinder

4 Driver
Percuteur
Treiber

5 Main housing
Corps
Gehäuse

6 Hanger
Suspension
Aufhänger

7 Piston
Piston
Kolben

8 Piston sealing
Joint de piston
Kolbendichtung

9 Handle
Poignée
Handgriff

10 Connecting nipple
Embout de raccordement
Anschlußnippel

11 Trigger
Déclencheur
Auslöser

12 Magazine
Magasin
Magazin

13 Muzzle
Nez
Mündung

14 Quick-action-connector
Raccord rapide
Schnellkupplung

Figure 1: Example of a compressed air operated fastener driving tool, total view

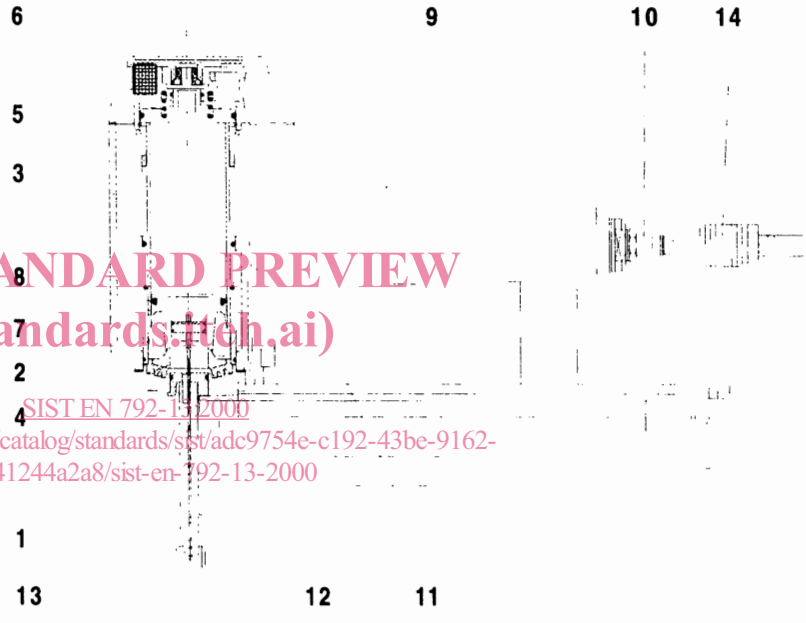

Figure 2: Example of a compressed air operated fastener driving tool, part sectional view

4 List of hazards

The sub numbers of the sub clauses of 4 HAZARDS refer to the respective sub clauses of 5 SAFETY REQUIREMENTS and 6 VERIFICATION.

4.1 Mechanical hazards

4.1.1 points and edges of fasteners,
4.1.2 ejection of fasteners,
4.1.3 free flight of fasteners,
4.1.4 poor design of the safety yoke,
4.1.5 poor design of fastener driving tools with safety yoke,
4.1.6 inadequate strength of the housing.

4.2 Electrical hazards

- caused by touching electrical parts of e.g. the ignition system on fastener driving tools operated by internal combustion.

4.3 Thermal hazards

caused by
- hot handle area in case of combustion powered fastener driving tools,
- cold handle area arising from decompression of air or gases.
- cold area arising from incidentally release of gas from combustion powered fastener driving tools

4.4 Hazards caused by noise

Noise caused by e.g.
- moving parts inside the tool,
- driving the fastener into the workpiece,
- resonance of the workpiece,
- discharging air or waste gases.

4.5 Hazards caused by mechanical impact (vibration)

muscoskeletal damages ...- caused by recoil of the fastener driving tool during driving operation.

4.6 Hazards caused by materials and substances which are processed or ejected by fastener driving tools

caused by
- ejection of chips of the collating material from strips or coils,
- discharge of air, gas.

4.7 Hazards caused by neglecting ergonomic principles in machine design

caused by
- defective balance of the fastener driving tool,
- unfavourable handle design for the anatomy of the human hand,
- weight of the tool,

resulting in for example
- impediment of safe handling,
- fatigue of hand and arm muscular system.

4.8 Hazards caused by inadequate user information

caused by for example:
- incorrect or insufficient marking of the tool with respect to declaration of e.g. energy supply, suitable fasteners,
- incorrect or insufficient operating instructions.

4.9 Hazards caused by fire and explosion

caused by
– the use of oxygen or inflammable gases as energy for driving operation on compressed air operated fastener driving tools,
- the release of flammable gases from combustion powered fastener driving tools.

5 Safety requirements and/or measures

5.1 Safety requirements in respect of mechanical hazards

Fastener driving tools shall be designed according to EN 292-1, EN 292-2 and EN 349.

5.1.1 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 muzzle 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 feeler.

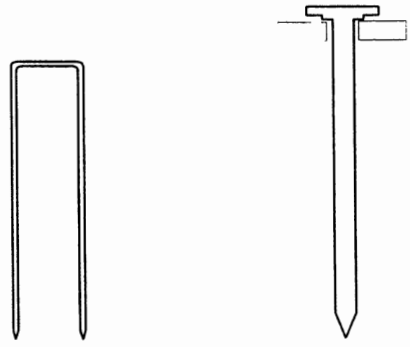

Figure 3: Example for protection covers by the magazine (sectional view)

5.1.2 Protection against ejected fasteners

5.1.2.1 Connection to the energy supply system

Fastener driving tools designed for connection to a energy supply system shall be equipped in such a way that they

- can be easily connected to and disconnected from the energy supply system using a quick-action coupling,
- cannot self actuate a driving operation on connection to the energy supply system,
- do not retain any energy for a driving operation following disconnection from the energy supply system.

NOTE: Because user of compressed air operated fastener driving tools can already possess a quick release system, the type of connecting nipple (see 3.8 item 10) can be delivered by choice of the manufacturer and can not necessary be fitted to the tool.
The quick-action-connector (see 3.8 item 14) is not constituent of delivery.

Dispensers for combustible gas and batteries for the ignition system on fastener driving tools operated by internal combustion must be capable of connection and disconnection without the need of service tools.

5.1.2.2 Prevention against accidental trigger actuation

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

NOTE: The trigger normally is fitted in the inner area of the handle contour of the fastener driving tool (see figure 2).

5.1.3 Protection against free flight of fasteners at high velocity

Fastener driving tools shall be fitted with a safety yoke which acts independently of the trigger and which is functionally safe. This safety yoke shall ensure that no driving operation can be performed before the muzzle of the tool is pressed to the workpiece.

A safety yoke is not required on fastener driving tools which accelerate the heaviest usable fasteners to a free flight velocity v_{lim} below the corresponding admissible 5,0 mm depth of penetration x_{pen} into human muscular tissue. See annex A (normative).

5.1.4 Design of the safety yoke

To minimise the possibility of a free flying fastener occurrence by accidentally touching the workpiece with the edge or corner of the safety yoke and therefore placing the muzzle outside the workpiece surface, the external dimensions of the safety yoke 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 (see figure 4).

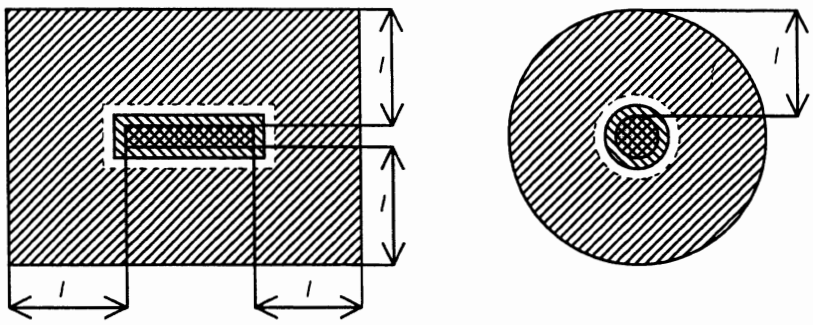

Figure 4: Safety yoke, example for outer surface

5.1.5 Design of fastener driving tools with safety yoke

5.1.5.1 Fastener driving tools with a safety yoke must be designed in such a way that the safety yoke does not actuate the trigger system when the tool is set down.

5.1.5.2 Depending on the length of usable fastener in the fastener driving tool, only fastener / tool combinations with an actuating system as given in table 1 are permitted.

Table 1: Permitted actuating systems related to the usable fastener length on fastener driving tools

Length of fastener	Actuating system	Particular requirements
> 130 mm	full sequential actuation (see 3.6.1.2)	the safety yoke in all positions of the tool must reliably return to its starting position
≤ 130 mm	single sequential actuation (see 3.6.1.1)	the safety yoke in all positions of the tool must reliably return to its starting position
≤ 100 mm > 65 mm	contact actuation (see 3.6.1.3)	≥ 125% of the tool weight[a] as spring load on the safety yoke
≤ 65 mm	contact actuation (see 3.6.1.3)	≥ 60% of the tool weight [a] as spring load on the safety yoke
	continuous contact actuation (see 3.6.1.4)	≥ 60% of the tool weight [a] as spring load on the safety yoke
[a] without fasterners		

NOTE: The spring load on the safety yoke can be generated for example by metal springs, elastic materials, compressed air operated parts.

5.1.6 Strength of the housing, stress by compressed air

5.1.6.1 The strength of fastener driving tool housings shall be suitable for the field of application.

5.1.6.2 Fastener driving tools operated by compressed air shall be designed in such a way that they withstand a minimum of 1,5 times the maximum allowable pressure ($p_{S\ max}$) without any safety related breakdown.

5.2 Electrical safety

All parts of battery powered electrical internal installation, for example for electronically control on compressed air operated or electrical ignition of internal combustion operated fastener driving tools, which carry a hazardous voltage during normal use, shall be insulated and covered in such a way as to avoid the risk of an electrical shock or the formation of an electric arc.

5.3 Thermal safety

5.3.1 Hot surfaces
The handles of fastener driving tools operated by internal combustion or other surfaces of the tool which may be touched by the operator during operation shall be designed in such a way that the surface temperatures do not exceed the limit values laid down in EN 563.

5.3.2 Cold surfaces

5.3.2.1 Compressed air operated fastener driving tools must 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.

5.3.2.2 The incidental release of gas from combustion powered fastener driving tools shall not cause iced areas to form on the handles.

5.4 Noise

Measures to reduce noise produced by fastener driving tools include for example reducing the generation of noise and constructing the fasteners in such a way that noise is reduced by damping, and in the case of compressed air operated fastener driving tools by fitting an exhaust air damper. See EN ISO 11688-1.

NOTE: In many cases in addition to the noise produced by a fastener driving tools in use, the noise generation at the point of action is influenced by the working operation itself and cannot be reduced by tool design. The noise at the point of action can for example depend on the working environment, the workpiece, the workpiece support, the number of driving operations, in the case of compressed air operated fastener driving tools and with regard to the desired use; on optimum regulation of the working pressure.

5.5 Mechanical impact (vibration)

The effect of mechanical impacts (vibration) transmitted to the hand-arm system should be kept to a minimum during operation of fastener driving tools.

NOTE: Factors of influence are constituted
- in the design of fastener driving tools by
  - weight,
  - driving velocity;
- in the handling process by
  - pressing effort,
  - hand gripping force depending on working direction,
  - adjustment of the energy supply (avoidance of excessive energy);
- in the case of the workpiece by
  - workpiece material (density, strength),
  - workpiece support.