SLOVENSKI STANDARD
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Earth-moving machinery - Safety - Part 10: Requirements for trenchers

Earth-moving machinery - Safety - Part 10: Requirements for trenchers

Erdbaumaschinen - Sicherheit - Teil 10: Anforderungen für Grabenfräsen

Engins de terrassement - Sécurité - Partie 10: Exigences applicables aux trancheuses

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English version

Earth-moving machinery - Safety - Part 10: Requirements for trenchers

Engins de terrassement - Sécurité - Partie 10: Exigences applicables aux trancheuses

Erdbaumaschinen - Sicherheit - Teil 10: Anforderungen für Grabenfräsen

This European Standard was approved by CEN on 2 March 1998.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Contents

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 151 "Construction equipment and building material machines - Safety", the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by September 1998, and conflicting national standards shall be withdrawn at the latest by September 1998.

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.

The annex A is normative and contains "List of additional hazards" and the annex B is informative and contains "Illustrations".

EN 474 "Earth-moving machinery - Safety" comprises the following parts:

Part 1	General requirements
Part 2	Requirements for tractor-dozers
Part 3	Requirements for loaders
Part 4	Requirements for backhoe-loaders
Part 5	Requirements for hydraulic excavators
Part 6	Requirements for dumpers
Part 7	Requirements for scrapers
Part 8	Requirements for graders
Part 9	Requirements for pipelayers
Part 10	Requirements for trenchers
Part 11	Requirements for earth and landfill compactors
Part 12	Requirements for rope excavators

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.

0 Introduction

This European Standard is a Type C-standard as stated in EN 292.

The machinery concerned and the extent to which hazards are covered are indicated in the scope of this standard.

1 Scope

This European Standard specifies additional requirements and/or exceptions from EN 474-1:1994 "Earth-moving machinery - Safety - Part 1: General requirements.

This European Standard applies to wheel and crawler trenchers defined in ISO 6165:1997 and gives additional requirements for attachments (see ISO 6016:1982) and for derivated machinery.

This European Standard deals with all significant hazards pertinent to trenchers when they are used as intended and under the conditions foreseen by the manufacturer (see annex A of this European Standard and annex C of EN 474-1:1994). This European Standard specifies the appropriate technical measures to eliminate or reduce risks arising from the significant hazards.

2 Normative references

This European Standard incorporates, by dated or undated reference, 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 apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 292-1:1991	Safety of machinery - Basic concepts - General principles for design - Part 1: Basic terminology, methodology
EN 292-2:1991	Safety of machinery - Basic concepts - General principles for design - Part 2: Technical principles and specification
EN 474-1:1994	Earth-moving machinery - General safety requirements
ENV 1070:1993	Safety of machinery - Terminology
EN 60068-2-27:1993	Basic environmental testing procedures - Part 2: Tests - Test Ea and guidance: Shock
EN 60204-1:1992	Safety of machinery - Electrical equipment - Part 1: General requirements
EN 60529:1991	Degrees of protection provided by enclosures (IP Code)
ISO 2867:1994	Earth-moving machinery - Access system
ISO 3411:1995	Earth-moving machinery - Human physical dimensions of operators and minimum operator space envelope
ISO 3457:1986	Earth-moving machinery - Guards and shields - Definitions

ISO 3471:1994	Earth-moving machinery - Roll-over protective structures - Laboratory tests and performance requirements.
ISO 4250-2:1991	Narrow and wide base off-road tyres and rims - Part 2: Loads and inflation pressures
ISO/DIS 4250-3:1993	Earth-mover tyres and rims - Part 3 - Rims
ISO 5006-1:1991	Earth-moving machinery - Operator's field of view - Part 1: Test method
ISO 5353:1995	Earth-moving machinery, and tractors and machinery for agriculture and forestry - Seat index point
ISO 6014:1986	Earth-moving machinery - Determination of ground speed
ISO 6016:1982	Earth-moving machinery - Methods of measuring the masses of whole machines, their equipment and components.
ISO 6165:1997	Earth-moving machinery - Basic types - Vocabulary
ISO/DIS 6393:1995	Acoustics - Measurement of exterior noise emitted by earth-moving machinery - Stationary test condition
ISO/DIS 6394:1995	Acoustics - Measurement of exterior noise emitted by earth-moving machinery - Operator's position - Stationary test condition
ISO 6405-1:1991	Earth-moving machinery - Symbols for operator controls and other displays - Part 1: Common symbols
ISO 6405-2:1993	Earth-moving machinery - Symbols for operator controls and other displays - Part 2: Specific symbols for machines, equipment and accessories
ISO 6682:1986	Earth-moving machinery - Zones of comfort and reach for controls
ISO 9244:1995	Earth-moving machinery - General principles for safety signs and hazard pictorials
ISO/DIS 9249:1995	Earth-moving machinery - Engine test code - Net power
ISO 10263-2:1994	Earth-moving machinery - Operator enclosure environment - Part 2: Air filter test
ISO 10263-4:1994	Earth-moving machinery - Operator enclosure environment - Part 4: Operator enclosure ventilation, heating and/or air-conditioning test method
ISO 10968:1995	Earth-moving machinery - Operator's controls
ISO 12509:1995	Earth-moving machinery - Lighting, signalling and marking lights and reflex-reflector devices
ISO/DIS 13766:1996	Earth moving machinery - Electro-magnetic compatibility

3 Definitions

For the purposes of this European Standard the definitions stated in ENV 1070:1993 apply.

Additional definitions specifically needed for this European Standard are added below.

3.1 Common definitions

Terminology for trenchers are specified below and illustrated in annex B.

Definitions used in EN and ISO standards referred to in this European Standard are also valid for this European Standard.

3.2 Additional definitions

3.2.1 **Trench**: a narrow horizontal excavation for which, in general, the depth is greater than the width.

3.2.2 **Trencher**: self-propelled crawler or wheeled machine, having a rear- and/or front-mounted equipment/attachment, primarily designed to produce a trench in a continuous operation, through a motion of the machine. This machine can be either ride-on or pedestrian controlled. The attachment can be a digging chain, or a wheel disk, or a plough blade, or similar.

3.2.3 **Protective bar**: structure generally above and parallel to the digging chain which provides a degree of protection from contact with the digging element, (see figures in annex B).

4 Safety requirements

4.1 Ride-on operated trenchers

4.1.1 Operator's station

4.1.1.1 Minimum space envelope

EN 474-1:1994, 4.2.2.5 applies with the following exceptions:

For trenchers with an operating mass (see ISO 6016:1982) of less than 2 000 kg the minimum space envelope width (dimension 920 mm, ISO 3411:1995, figure 5) shall not be less than 650 mm at elbow height.

4.1.1.2 Heating and ventilation system

If a heating and ventilation system according to EN 474-1:1994, 4.2.2.6, is required the following applies. The heating and ventilation system shall:

- either comply with ISO 10263-4:1994

- or have the capacity of increasing the temperature of the air inside the cab and maintain a temperature of + 18° C at the expected ambient temperature. The minimum capacity of the heating system shall have a Δ of 25°C measured at - 10° C ambient temperature.

Measurement of the system capacity shall be made at three points. The three points shall be located in a vertical plane through the SIP and parallel to the longitudinal axis of the machine as follows (see figure 1):

- at filament position centre-point as defined in ISO 5006-1:1991;
- at the SIP as defined in ISO 5353:1995;
- 100 mm above floor plate and 600 mm in front of SIP.

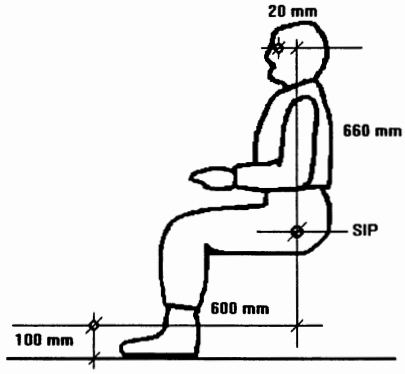

Figure 1: Location of measuring points

Alternatively the heating capacity can be determined by calculation.

The ventilation system shall be capable of providing the cab with filtered fresh air at the minimum of 43 m^3/h. The filter shall be tested according to ISO 10263-2:1994.

NOTE: The filter element selection depends on the intended operating environment conditions.

4.1.2 Operator's protection

4.1.2.1 Roll-over protective structure (ROPS)

A roll-over protective structure (ROPS) shall be fitted. ROPS shall comply with ISO 3471:1994.

Crawler trenchers with an elevating operator's station to improve visibility, shall provide sufficient protection for the operator. ISO 3471:1994 shall apply with the following provisions:

- the operating station (e.g. cab) alone shall be considered a separate, independent roll-over protective structure;
- only the vertical load test of ISO 3471:1994 shall be applied in all planes;
- in case of symmetrical design of the structure in one (or more) direction(s): front/rear, left/right, top/bottom, only one test is required in this (these) particular direction(s);
- ISO 3471:1994, 8.8 does not apply.

4.1.2.2 Lowering of elevated cab in case of failure

In case of failure of source of energy, failure of the control circuit or with the engine stopped it shall be possible for the operator to lower the cab or to leave the machine safely (e.g. by steps, stairs etc. see ISO 2867:1994).

In case of hose failure the lowering speed of the elevated cab shall not exceed 0,3 m/s.

4.1.2.3 Fenders

Trenchers with a designed speed (see ISO 6014:1986) > 30 km/h shall be equipped with fenders which comply with ISO 3457:1986 that protect the operator's station from debris ejected by the tyres if the risk exists.

4.1.3 Operator's seat

Subclause 4.3 and annex A in EN 474-1:1994 applies with the following exception:

4.1.3.1 Adjustment

4.1.3.1.1 Seat with a longitudinal position

For machines with an operating mass (see ISO 6016:1982) < 3 500 kg the following changes apply:

- either the fore and aft adjustment (see EN 474-1:1994, annex A, table A 1, dimension Z4) shall be at least ± 35 mm or corresponding adjustment of frequently used operator controls (see ISO 6682:1986) shall be provided;

- vertical adjustment may not be applied.

4.1.3.1.2 Seat with a transversal position

Fore and aft adjustment is not required.

4.1.3.2 Additional/separate operator's seat

If a separate seat is required for control of a special attachment (e.g. hoe equipment) the following applies provided the machine remains stationary, during attachment operation:

- a separate cab is not required (EN 474-1:1994, 4.2.2 does not apply);

- a roll-over protective structure is not required (EN 474-1:1994, 4.2.4 does not apply);

4.1.4 Operator's controls

Operator's controls shall follow the principles of ISO 10968:1995.

The normal engine stopping device shall be within the zone of reach (see ISO 6682:1986).

If a separate seat for an additional attachment is provided (e.g. backhoe) an additional engine stopping device shall be fitted if the normal stopping device is not within the zone of reach from the second seat.

4.1.4.1 Deactivation device

EN 474-1:1994, 4.4 applies with the following addition:

Trenchers shall be equipped with a deactivation device to stop machine travel and attachment movement when the operator leaves the operator's station.

4.1.4.2 Attachment lowering

EN 474-1:1994, 4.4.2.4 applies with the exception:

Machine attachments with hydraulic lock-outs fitted directly onto the cylinder(s) do not need to be lowered to the ground.

4.1.5 Remote control

EN 474-1:1994, 4.4.2.6 applies with the following additions:

4.1.5.1 Control box

Activation of controls shall only be possible from a portable remote control box. The remote control box shall have a key switch for activation/deactivation of the remote control.

4.1.5.1.1 General requirements

By design the control box shall not obstruct the machine operator's freedom of movement and shall not be affected by impacts and shocks (15 g shock load for 11 ms, see EN 60068-2-27:1993) which could cause inadvertent machine movements. The environmental protection of the control box shall be IP 65 (see EN 60529:1991).

4.1.5.1.2 Emergency stop

The remote control box shall be fitted with an emergency stop that fulfils the requirements of 10.7 of EN 60204-1:1992.

4.1.5.1.3 Controls

The control box shall have clearly marked directions of movements for the machine and it's attachment (see ISO 6405-1:1991 and ISO 6405-2:1993) and be safeguarded against unintentional actuation e.g. push buttons with protective collars. It shall be possible to lock the controls in the deactivated mode against unintentional or unauthorized actuation. The machine shall be held in the standstill position (at maximum slope as specified by the manufacturer) when remote controls for driving are in the neutral position.