SLOVENSKI STANDARD
SIST EN 474-5:2007+A2:2012

01-marec-2012

Stroji za zemeljska dela - Varnost - 5. del: Zahteve za hidravlične bagre

Earth-moving machinery - Safety - Part 5: Requirements for hydraulic excavators

Erdbaumaschinen - Sicherheit - Teil 5: Anforderungen für Hydraulikbagger

Engins de terrassement - Sécurité - Partie 5: Prescriptions applicables aux pelles hydrauliques

Ta slovenski standard je istoveten z: **EN 474-5:2006+A2:2012**

ICS:

53.100 Stroji za zemeljska dela Earth-moving machinery

SIST EN 474-5:2007+A2:2012 **en,fr**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 474-5:2006+A2

January 2012

ICS 53.100

Supersedes EN 474-5:2006+A1:2009

English Version

Earth-moving machinery - Safety - Part 5: Requirements for hydraulic excavators

Engins de terrassement - Sécurité - Partie 5: Prescriptions applicables aux pelles hydrauliques

Erdbaumaschinen - Sicherheit - Teil 5: Anforderungen für Hydraulikbagger

This European Standard was approved by CEN on 17 April 2006 and includes Amendment 1 approved by CEN on 20 December 2008 and Amendment 2 approved by CEN on 22 November 2011.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 474-5:2006+A2:2012: E

Contents

Page

Foreword 3
Introduction 4
1 Scope 5
2 Normative references 5
3 Terms and definitions 6
4 List of additional significant hazards 7
5 Safety requirements and/or measures 7
5.1 General 7
5.2 Access 7
5.3 Operator's station 7
5.4 Controls for driving and steering 8
5.5 Swing brakes 8
5.6 Stability and safety devices 8
5.7 Parking brake for compact crawler excavator 10
5.8 Specific requirements for walking excavators 10
6 Information for use 14
Annex A (informative) **List of additional significant hazards – Hydraulic excavators** 15
Annex B (informative) **Rated lift capacity tables for object handling** 17
Annex C (normative) **Requirements for excavator swing brakes** 21
Annex D (informative) **Illustrations** 25
Annex ZA (informative) **⟨A1⟩ Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC ⟨A1⟩** 29
Bibliography 30

Figures

Figure 1 — Tipping lines of walking excavators 13
Figure 2 — Measurement of the tipping load to front/rear 13
Figure 3 — Measurement of tipping load to the side 14
Figure C.1 — Swing service brake 22
Figure D.1 — Crawler excavator 25
Figure D.2 — Compact crawler excavator 25
Figure D.3 — Wheel excavator 26
Figure D.4 — Compact wheel excavator 26
Figure D.5 — Walking excavator 27

Tables

Table A.1 — List of additional significant hazards 15
Table B.1 — Example of rated lift capacity table for crawler excavators 19
Table B.2 — Example of rated lift capacity table for wheel excavators 20

Foreword

This document (EN 474-5:2006+A2:2012) 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 July 2012, and conflicting national standards shall be withdrawn at the latest by July 2012.

This document includes Amendment 1, approved by CEN on 2008-12-20 and Amendment 2, approved by CEN on 2011-11-22.

This document supersedes ⟦A2⟩ EN 474-5:2006+A1:2009 ⟨A2⟧.

The start and finish of text introduced or altered by amendment is indicated in the text by tags ⟦A1⟩ ⟨A1⟧ and ⟦A2⟩ ⟨A2⟧.

This document 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.

⟦A2⟩ For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document. ⟨A2⟧

For bibliographic references, see ⟦A1⟩ EN 474-1:2006+A1:2009 ⟨A1⟧.

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 cable excavators

This European Standard is intended for use in combination with Part 1 of the series.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

Introduction

This part of EN 474 is a type C standard as stated in EN ISO 12100-1:2003.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this European Standard.

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 the other standards, for machines that have been designed and built according to the provisions of this type C standard.

1 Scope

This part of EN 474 deals with all specific significant hazards, hazardous situations and events relevant to hydraulic excavators as defined in EN ISO 6165:2006, when they are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer (see Clause 4).

This part also deals with object handling application, shovel application and log application.

The requirements of this part are complementary to the common requirements formulated in ⟨A1⟩ EN 474-1:2006+A1:2009 ⟨A1⟩.

This part does not repeat the requirements from ⟨A1⟩ EN 474-1:2006+A1:2009 ⟨A1⟩, but adds or replaces the requirements for application for hydraulic excavators.

This part specifies the appropriate technical measures to eliminate or reduce risks arising from the significant hazards, hazardous situations and events during commissioning, operation and maintenance of hydraulic excavators.

This European Standard is not applicable to hydraulic excavators manufactured before the date of publication of this European Standard by CEN.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

⟨A1⟩ EN 474-1:2006+A1:2009 ⟨A1⟩, *Earth-moving machinery — Safety — Part 1: General requirements*

EN 12643:1997, *Earth-moving machinery — Rubber-tyred machines — Steering requirements (ISO 5010:1992, modified)*

⟨A1⟩ *deleted text* ⟨A1⟩

EN 13531:2001, *Earth-moving machinery — Tip-over protection structure (TOPS) for compact excavators — Laboratory tests and performance requirements (ISO 12117:1997 modified)*

⟨A1⟩ EN ISO 2867:2008 ⟨A1⟩, *Earth-moving machinery — Access systems* ⟨A1⟩ *(ISO 2867:2006, including Cor 1:2008)* ⟨A1⟩

⟨A1⟩ EN ISO 3449:2008 ⟨A1⟩, *Earth-moving machinery - Falling-object protective structures - Laboratory tests and performance requirements (ISO 3449:2005)*

⟨A1⟩ EN ISO 3471:2008, *Earth-moving machinery - Roll-over protective structures - Laboratory tests and performance requirements (ISO 3471:2008)* ⟨A1⟩

EN ISO 6165:2006, *Earth-moving machinery — Basic types —* ⟨A1⟩ *deleted text* ⟨A1⟩ *Identification and terms and definitions (ISO 6165:2006)*

⟨A1⟩ EN ISO 6682:2008 ⟨A1⟩, *Earth-moving machinery — Zones of comfort and reach for controls (ISO 6682:1986 including Amendment 1:1989)*

⟨A1⟩ EN ISO 6683:2008 ⟨A1⟩, *Earth-moving machinery — Seat belts and seat belt anchorages — Performance requirements and tests (ISO 6683:2005)*

[A1] EN ISO 7096:2008 [A1], *Earth-moving machinery — Laboratory evaluation of operator seat vibration (ISO 7096:2000)*

EN ISO 12100-1:2003, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology (ISO 12100-1:2003)*

ISO 6014:1986, *Earth-moving machinery — Determination of ground speed*

[A1] ISO 7451:2007 [A1], *Earth-moving machinery — Volumetric ratings for hydraulic excavator buckets and backhoe loader buckets*

ISO 7546:1983, *Earth-moving machinery — Loader and front loading excavator buckets — Volumetric ratings*

ISO 8643:1997, *Earth-moving machinery — Hydraulic excavator and backhoe loader boom-lowering control device — Requirements and tests*

ISO 10262:1998, *Earth-moving machinery — Hydraulic excavators — Laboratory tests and performance requirements for operator protective guards*

[A1] ISO 10567:2007 [A1], *Earth-moving machinery — Hydraulic excavators — Lift capacity*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in [A1] EN 474-1:2006+A1:2009 [A1], EN ISO 12100-1:2003 and the following apply.

NOTE 1 Terminology for hydraulic excavators are specified in ISO 7135:1993 and illustrated in Annex D (Figures D.1 to D.5) of this European Standard.

NOTE 2 Definitions used in EN and ISO standards referred to in this European Standard are also valid for this document.

3.1
hydraulic excavator
self-propelled machine on crawler, wheels or legs, having an upper structure normally capable of 360° swing with mounted equipment, primarily designed for excavating with bucket, without moving the undercarriage during the work cycle

NOTE 1 An excavator work cycle normally comprises excavating, elevating, swinging and discharging material (see EN ISO 6165:2006).

NOTE 2 Hydraulic excavators may also be used for material handling/transportation.

3.1.1
minimal swing radius excavator (MSRX)
excavator for operation in confined space having an upper structure with a short swing radius (equipment and attachment swing within 120 % of the width of the undercarriage)

3.1.2
compact excavator
excavator and minimal swing radius excavator with an operating mass (see [A1] ISO 6016:2008 [A1]) of less than or equal to 6 000 kg

3.2
walking excavator
excavator with three or more supporting legs which may be articulated, telescopic or both and which can be fitted with wheels

4 List of additional significant hazards

See Annex A.

NOTE Annex A (normative) contains all the significant hazards, hazardous situations and events, as far as they are dealt with in this European Standard, identified by risk assessment as significant for this type of machinery and which require action to eliminate or reduce the risk.

5 Safety requirements and/or measures

5.1 General

Hydraulic excavators shall comply with the requirements of ⟦A1⟩ EN 474-1:2006+A1:2009 ⟨A1⟧, as far as not modified or replaced by the requirements of this part.

5.2 Access

⟦A1⟩ EN 474-1:2006+A1:2009 ⟨A1⟧, 5.2 applies with the exception that dimension *G*, in ⟦A1⟩ EN ISO 2867:2008 ⟨A1⟧, Figure 2, can be greater than 600 mm when the hand rails/hand holds are in the door opening.

5.3 Operator's station

5.3.1 Minimum space envelope

On excavators with retractable front window, the cab height above SIP shall not be less than 920 mm measured with the window retracted into the cab.

5.3.2 Operator's protection

5.3.2.1 Operator’s protective guard

⟦A1⟩ EN 474-1:2006+A1:2009 ⟨A1⟧, 5.3.4 is replaced by the following:

Excavators shall be designed so that an operator's protective guard can be fitted. The manufacturer according to the intended use of the machine shall offer a protective guard. The protective guard shall be in accordance with ISO 10262:1998.

Compact excavators with an operating mass (see ⟦A1⟩ ISO 6016:2008 ⟨A1⟧) less than or equal to 1 500 kg are excluded from the requirements for a protective guard according to ISO 10262:1998.

5.3.2.2 Roll over and tip over protective structures (ROPS and TOPS)

⟦A1⟩ EN 474-1:2006+A1:2009 ⟨A1⟧, 5.3.3 does not apply for hydraulic excavator except for walking excavators, see 5.8.3:

Compact excavators having an operating mass greater than 1 000 kg shall be fitted with a tip over protective structure (TOPS) according to EN 13531:2001.

5.3.2.3 Protection for log application

The excavator shall be equipped with a front protection and, if a relevant hazard exists, with a top protection, according to ISO 10262:1998.

5.3.3 Operator's seat

5.3.3.1 Seat adjustment for compact excavators

[A1] EN 474-1:2006+A1:2009 [A1], 5.4.1.3, 2nd paragraph only applies to excavators with an operating mass (see [A1] ISO 6016:2008 [A1]) of less than 3 000 kg.

5.3.3.2 Vibration

[A1] EN 474-1:2006+A1:2009 [A1], 5.4.1.4, applies to excavators except for compact excavators. The seat, except for compact excavators, shall comply with spectral class EM 6 of [A1] EN ISO 7096:2008 [A1].

NOTE According to [A1] EN ISO 7096:2008 [A1], 1.2.2, there is no requirement on seat suspension for seats used in excavators.

5.3.3.3 Rear window

[A1] EN 474-1:2006+A1:2009 [A1], 5.3.2.9 applies with the exception that the rear window of an excavator does not need to be equipped with window wipers, washers and defrosters.

5.4 Controls for driving and steering

[A1] EN 474-1:2006+A1:2009 [A1], 5.5.1 d) and 5.6.1 apply with the following addition relating to controls for driving and steering:

The movements of the controls for driving and steering do not need to correspond to the intended direction of movement if the upper structure is not in the normal driving direction.

[A1] EN 474-1:2006+A1:2009 [A1], 5.6.2 applies only to excavators with a travelling speed of higher than 30 km/h measured according to ISO 6014:1986.

For machines with a travel speed equal to or lower than 30 km/h EN 12643:1997 shall be applied, except for the requirements for emergency steering.

5.5 Swing brakes

Swing brakes shall comply with the requirements as defined in Annex C.

5.6 Stability and safety devices

5.6.1 General

[A1] EN 474-1:2006+A1:2009 [A1], 5.11 applies with the additions given in 5.6.2 to 5.6.4.

All rated capacities as defined hereafter are based on test and/or calculations of machines being level and on firm supporting surface.

The mass of the intended load, its density and the location of its centre of gravity as well as the mass of the attachment and the attachment bracket, if fitted, shall be included in the determination of the rated lift capacity and the size/capacity of the attachment.

To provide a sufficient stability, the rated lift capacity in intended operations shall be determined in accordance with 5.6.2 to 5.6.4

5.6.2 Bucket and shovel application

The rated lift capacity for an excavator used in bucket or shovel application shall be determined either by:

— rated tipping load according to [A1] ISO 10567:2007, 3.8 [A1], in the most unfavourable position; or

— hydraulic lift capacity according to [A1] ISO 10567:2007, 3.11 [A1].

whichever is less.

The volumetric rating of the bucket or shovel shall be determined according to [A1] ISO 7451:2007 [A1] or ISO 7546:1983.

NOTE The mass and the volumetric rating of the bucket and the density of the material have to be taken into account when a bucket is selected for a specific application.

5.6.3 Log application

The rated lift capacity in *stationary* log application shall be determined either by:

— rated tipping load according to [A1] ISO 10567:2007, 3.8 [A1], with a log in the most unfavourable position; or

— hydraulic lift capacity according to [A1] ISO 10567:2007, 3.11 [A1].

whichever is less.

The rated lift capacity in moving (driving with load) log application shall be determined either by:

— rated tipping load as 60 % of the tipping load according to [A1] ISO 10567:2007, 3.7 [A1], with a log in the most unfavourable position; or

— hydraulic lift capacity according to [A1] ISO 10567:2007, 3.11 [A1].

whichever is less.

5.6.4 Object handling application

5.6.4.1 General

The rated lift capacity of excavators shall be determined according to 5.6.4.2.

5.6.4.2 Rated lift capacity in object handling

The rated lift capacity in object handling shall be determined according to [A1] ISO 10567:2007, 3.13 [A1].

5.6.4.3 Rated lift capacity table in object handling

A table of the rated lift capacity in object handling, established by the manufacturer, shall be provided. Annex B gives an example for such a table. The table(s) shall be available at the operator's station for each object-handling configuration specified in the operation manual.

5.6.4.4 Load safety devices

Excavators used in object handling operations and with a maximum rated lift capacity according to [A1] EN 474-1:2006+A1:2009 [A1], 3.5 greater than or equal to 1 000 kg, at a minimum lift point radius, as

defined in [A1] 3.5 of ISO 10567:2007 [A1], or an overturning moment greater than or equal to 40 000 Nm, shall be equipped with:

a) an acoustic or visual warning device which indicates to the operator when the rated lift capacity or corresponding load moment is reached and continues as long as the load or load moment is exceeded. The rated lift capacity is defined in 5.6.4.2. This device may be deactivated while the excavator equipment is performing operations other than object handling. The activation shall be clearly indicated. The control of the deactivation shall be within the operator's zone of comfort according to [A1] EN ISO 6682:2008 [A1]. A warning sign shall be placed close to the control device indicating the need for activation during object handling.

b) [A2] a lowering control device on each raising boom and arm cylinder. For arm cylinders the device(s) shall be installed at the end which is pressurised to raise the arm away from the base machine. Lowering control devices for boom and arm cylinder(s) shall be tested in accordance with ISO 8643:1997.

NOTE The scope of ISO 8643:1997 (currently under revision) does not cover the testing of arm cylinder devices. However, arm cylinder devices should be tested by the same procedure as those described for boom lowering control devices. [A2]

5.6.4.5 Other applications

The rated lift capacity of derivated machinery shall be determined by the manufacturer according to the load specification given in 5.6.4.2 and 5.6.4.3, whereby the comparable hazard has to be considered for the special application.

5.7 Parking brake for compact crawler excavator

5.7 of [A1] EN 474-1:2006+A1:2009 [A1] applies with the addition that the working tool (e. g. bucket) or a special attachment (e. g. dozer blade) can alternatively be used to immobilise the machine. The procedure to secure the compact crawler excavator shall be described in the operation manual.

5.8 Specific requirements for walking excavators

5.8.1 Operator's station

5.8.1.1 Steering system

5.6.1 of [A1] EN 474-1:2006+A1:2009 [A1] does not apply.

5.8.1.2 Visibility

5.8.1 of [A1] EN 474-1:2006+A1:2009 [A1] does not apply.

The ground contacting part of each leg in all possible positions shall be visible from the operator's station to ensure that the operator can place the legs on firm ground.

5.8.1.3 Egress

In case of failure of source of energy, or with the engine stopped, it shall be possible for the operator to leave the machine safely (e. g. by lowering down the operator's station, steps, stairs).

5.8.2 Wheel brake system

5.7 of [A1] EN 474-1:2006+A1:2009 [A1] does not apply to walking excavators with not more than two wheels.