SLOVENSKI STANDARD
SIST EN 474-4:2022

01-maj-2022

Nadomešča:
SIST EN 474-4:2007+A2:2012

Stroji za zemeljska dela - Varnost - 4. del: Zahteve za bagre

Earth-moving machinery - Safety - Part 4: Requirements for backhoe loaders

Erdbaumaschinen - Sicherheit - Teil 4: Anforderungen für Baggerlader

Engins de terrassement - Sécurité - Partie 4 : Prescriptions applicables aux chargeuses-pelleteuses

Ta slovenski standard je istoveten z: **EN 474-4:2022**

ICS:

53.100	Stroji za zemeljska dela	Earth-moving machinery

SIST EN 474-4:2022 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 474-4

March 2022

ICS 53.100

Supersedes EN 474-4:2006+A2:2012

English Version

Earth-moving machinery - Safety - Part 4: Requirements for backhoe loaders

Engins de terrassement - Sécurité - Partie 4 : Prescriptions applicables aux chargeuses-pelleteuses

Erdbaumaschinen - Sicherheit - Teil 4: Anforderungen für Baggerlader

This European Standard was approved by CEN on 14 February 2022.

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, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No. EN 474-4:2022 E

Contents

Page

European foreword

This document (EN 474-4:2022) 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 2022, and conflicting national standards shall be withdrawn at the latest by March 2024.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 474-4:2006+A2:2012.

This document has been prepared under a standardization request 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 document.

For bibliographic references, see EN 474-1:2022.

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

— Part 13: Requirements for rollers

This document is intended for use in combination with part 1 of the series.

The main differences between this document and EN 474-4:2006+A2:2012 are as follows:

a) safety-related functions of control systems (excluded);

b) requirements for attachments, multi-purpose and derivative machinery (deleted);

c) the normative references (updated) (Clause 2);

d) definition of compact crawler backhoe loader up to 6t (modified);

e) requirements for lifting operation of backhoe portion (updated);

f) verification methods table (added) (Clause 5);

g) requirements for quick couplers (added);

h) list of significant hazards (Annex A) (updated);

i) Annex ZA (updated).

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations 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, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This document is a type C standard as stated in EN ISO 12100:2010.

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

— machine manufacturers (small, medium and large enterprises);

— health and safety bodies (regulators, accident prevention organizations, market surveillance, etc.).

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

— machine users/employers (small, medium and large enterprises);

— machine users/employees (e.g. trade unions, organizations for people with special needs);

— service providers, e.g. for maintenance (small, medium and large enterprises);

— consumers (in case of machinery intended for use by consumers).

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document.

The machinery concerned and the extent to which hazards, hazardous situations or hazardous events are covered are indicated in the Scope of this document.

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

1 Scope

This document together with EN 474-1:2022 deals with all significant hazards, hazardous situations and events relevant to backhoe loaders when used as intended and under the conditions of misuse which are reasonably foreseeable by the manufacturer (see Annex A) associated with the whole lifetime of the machine as described in EN ISO 12100:2010, 5.4.

The requirements of this document are complementary to the common requirements formulated in EN 474-1:2022. This document does not repeat the requirements of EN 474-1:2022 but supplements or modifies the requirements for backhoe loaders.

This document does not provide requirements for main electrical circuits and drives of machinery when the primary source of energy is an external electrical supply.

This document does not provide performance requirements for safety related functions of control system(s).

This document does not deal with demolition machinery.

This document also deals with fork application, log handling application and lifting operation application.

This document is not applicable to backhoe loaders which are manufactured before the date of publication of this document by CEN.

2 Normative references

The following documents are referred to in the 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.

EN 474-1:2022, *Earth-moving machinery — Safety — Part 1: General requirements*

EN ISO 7096:2020, *Earth-moving machinery — Laboratory evaluation of operator seat vibration (ISO 7096:2020)*

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

ISO 2330:2002, *Fork-lift trucks — Fork arms — Technical characteristics and testing*

ISO 7451:2007, *Earth-moving machinery — Volumetric ratings for hoe-type and grab-type buckets of hydraulic excavators and backhoe loaders*

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

ISO 9248:1992, *Earth-moving machinery — Units for dimensions, performance and capacities, and their measurement accuracies*

ISO 9533:2010, *Earth-moving machinery — Machine-mounted audible travel alarms and forward horns — Test methods and performance criteria*

ISO 14397-1:2007, *Earth-moving machinery — Loaders and backhoe loaders — Part 1: Calculation of rated operating capacity and test method for verifying calculated tipping load*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 474-1:2022, EN ISO 12100:2010 and the following apply.

NOTE Terminology for backhoe loaders is specified in ISO 8812:2016 and most common backhoe loaders are illustrated in Annex C of this document.

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

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

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

3.1
backhoe loader
self-propelled crawler or wheeled machine having a main frame designed to carry both front-mounted equipment and rear-mounted backhoe equipment, normally with stabilisers or outriggers (see EN ISO 6165:2012)

Note 1 to entry: When used in backhoe mode, the machine is stationary and normally digs below ground level, but when used in loader mode (bucket use), the machine loads through forward motion.

Note 2 to entry: A backhoe work cycle normally comprises excavating, elevating, swinging and discharging material. A loader work cycle normally comprises filling, elevating, transporting and discharging material.

3.2
compact backhoe loader
wheeled backhoe loader with an operating mass (see ISO 6016:2008) of ≤ 4 500 kg, or crawler backhoe loader with an operating mass of ≤ 6 000 kg designed to work in confined spaces with the associated needs for greater manoeuvrability

3.3
load centre of gravity distance
distance “D” in mm from the centre of gravity “G” of the load measured horizontally to the front face of the fork shanks as specified in Figure 1

3.4
lift point radius
horizontal distance between the bucket pivot pin and the swing pivot centre

Note 1 to entry: The bucket pivot pin and the swing pivot centre are illustrated in ISO 8812:2016, Figure 15a, Position 4 and 13.

3.5
rated lift capacity
smaller of either the maximum load or the rated hydraulic lift capacity

4 Safety requirements and/or protective/risk reduction measures

4.1 General

4.1.1 Context

Backhoe loaders shall comply with the safety requirements and/or protective/risk reduction measures of this clause. In addition, the machines shall be designed according to the principles of EN ISO 12100:2010 for relevant but not significant hazards which are not dealt with by this document.

4.1.2 Specific relation to EN 474-1

Backhoe loaders shall comply with the requirements of EN 474-1:2022, as far as not modified or replaced by the requirements of this part.

There are general requirements specified in EN 474-1:2022 that are not applicable because the risk assessment has shown that for backhoe loaders the corresponding hazard does not exist. Therefore, for backhoe loaders 4.3.5, 4.4.2.2, 4.22.5 and Annex B in EN 474-1:2022, are not applicable.

4.2 Operator's station

EN 474-1:2022, 4.3 applies, with the following addition to EN 474-1:2022, 4.3.1.2 for backhoe loaders with retractable rear window:

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

4.3 Seat

EN 474-1:2022, 4.4 applies with the following addition to EN 474-1:2022, 4.4.1.4:

For backhoe loader the seat shall comply with spectral classes of EN ISO 7096:2020 according to Table 1.

Table 1 — Seat criteria for backhoe loaders

Wheeled backhoe loader	EM5
Compact wheeled backhoe loader	EM8
Crawler backhoe loader	EM6

4.4 Operator's controls and indicators

EN 474-1:2022, 4.5 applies with the following addition:

EN 474-1:2022, 4.5.3 also applies for the operator’s movement in the cab from one operating position to another operating position (e.g. from the loader operating position to the backhoe operating position), and the movement of the operator’s seat.

4.5 Outrigger up protective device

An acoustic and visual warning device shall be installed to warn the operator when the travel motion is engaged with lowered outriggers

4.6 Horn for the backhoe portion

EN 474-1:2022, 4.9 applies with the following addition:

The horn sound pressure level shall be greater than or equal to 93 dB (A) at 7 m distance to the rear of the backhoe, with the backhoe moved to the least favourable position to provide maximum masking at position 5 of ISO 9533:2010, 7.1, so that the swing frame, boom or an attachment provide maximum masking to the warning device(s).

The operator shall be able to activate the horn from the backhoe operation position.

4.7 Stability

4.7.1 General

EN 474-1:2022, 4.11 applies with the additions given in 4.7.2 and 4.7.3 below.

All rated capacities as defined hereafter are based on tests, calculations, or both, of machines on a level and firm supporting surface.

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

To provide a sufficient stability the rated operating capacity/rated lift capacity in intended operations shall be determined as specified in 4.7.2 and 4.7.3.

4.7.2 Loader portion

4.7.2.1 General

The rated capacities of the backhoe loader used in loader application shall be determined as follows with the backhoe in its transport position as specified by the manufacturer.

4.7.2.2 Loader bucket application

The rated operating capacity shall be determined according to ISO 14397-1:2007.

The volumetric rating of bucket shall be determined according to ISO 7546:1983.

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

4.7.2.3 Loader fork application

4.7.2.3.1 Rated operating capacity

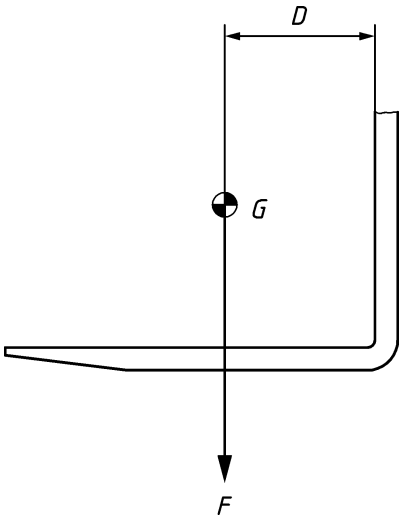
The rated operating capacity is based on the use of forks and shall be determined according to ISO 14397-1:2007 (except for the stability factors (k) stated in ISO 14397-1:2007, 5.1, Table 1) and with the fork in a horizontal position. Stability factors (k) specified in Table 2 shall apply.

Table 2 — Stability factors in fork application

Ground condition	Wheel backhoe loader	Crawler backhoe loader
Rough terrain	0,60	-
Firm and level ground	0,80	-
All	-	0,35

4.7.2.3.2 Fork load centre of gravity

The load centre of gravity distance, *D*, is determined as a point on the longitudinal centreline of the machine at half the distance from the most rearward point of the load opening to the tip of the fork, as shown in Figure 1.



Key

D distance in millimetres (see Table 3)
F load in Newton
G load centre of gravity

Figure 1 — Load centre of gravity distance with fork arms

4.7.2.3.3 Fork size

Fork arms shall meet the performance requirements stated in ISO 2330:2002.

To select the fork arm size and to determine the load centre of gravity distance (*D*) as shown in Figure 1, the specifications in Table 3 shall be followed.

Table 3 — Typical load centre of gravity distance

Load *F* in N			Load centre of gravity distance *D* in mm				
			400	500	600	900	1 200
F	<	10 000	X				
10 000	≤ *F* <	50 000		X			
50 000	≤ *F* <	100 000			X		
100 000	≤ *F* <	200 000			X	X	X
200 000	≤ *F* <	250 000				X	X
F	≥	250 000					X

NOTE For loads below 10 000 N a 500 mm load spacing dimension is optional.