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Stroji za zemeljska dela - Varnost - 9. del: Zahteve za stroje za polaganje cevi

Earth-moving machinery - Safety - Part 9: Requirements for pipelayers

Erdbaumaschinen - Sicherheit - Teil 9: Anforderungen für Rohrverleger

Engins de terrassement - Sécurité - Partie 9 : Prescriptions applicables aux poseurs de canalisations

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Erdbaumaschinen - Sicherheit - Teil 9: Anforderungen für Rohrverleger

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

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European foreword

This document (EN 474-9:2022) 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of an identical text or by endorsement, at the latest by September 2022, and conflicting national standards shall be withdrawn at the latest by March 2024.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 474-9:2006+A1:2009.

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 474-9:2006+A1:2009 are as follows:

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

b) safety related functions of control systems (excluded);

c) pipelayers shall be equipped with cab, and ROPS, TOPS (4.2) (added);

d) windows shall be provided with motorised wiper(s) and washer in the travelling and lifting (e.g. side boom application) directions (4.2.2) (added);

e) means shall be provided to ensure operator visibility to the pipe area from the operator station during the lifting, translation operations and combination of both (4.5) (added);

f) pipelayers are equipped with Load capacity indicator and warning device, Rated capacity limiting, Hoisting limiter device and Lowering limiter (4.6) (added);

g) the load capacity indicator shall take in account the ground slope condition and provide information about weight of load and weight rated capacity (4.6.7) (added);

h) pipelayers with a lifting hoist shall be fitted with a lowering limiter. As a minimum, the lowering limiter shall ensure three turns of rope on the drum. (4.6.10) (added);

i) if a pipelayer is equipped with a rear mounted winch, ISO 19472:2006 shall be used as guidance for design. (4.7.1) (added);

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

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

l) 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.

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 pipelayers as defined in 3.1, 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 pipelayers.

This document also specifies additional requirements for rear mounted winches.

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

The following significant and relevant hazards are not covered in this document:

— Transmission of power between self-propelled machinery (or tractor) and recipient machinery;

— Laser;

— Lightning.

Pipelayers with rotating upper structure are excluded from the scope of this document.

This document is not applicable to pipelayers 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 1032:2003+A1:2008, *Mechanical vibration — Testing of mobile machinery in order to determine the vibration emission value*

EN 1677-1:2000+A1:2008, *Components for slings — Safety — Part 1: Forged steel components, Grade 8*

EN 1677-2:2000+A1:2008, *Components for slings — Safety — Part 2: Forged steel lifting hooks with latch, Grade 8*

EN 13000:2010+A1:2014, *Cranes — Mobile cranes*

EN ISO 3411:2007, *Earth-moving machinery — Physical dimensions of operators and minimum operator space envelope (ISO 3411:2007)*

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

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 6393:2008, *Earth-moving machinery — Determination of sound power level — Stationary test conditions*

ISO 6394:2008, *Earth-moving machinery — Determination of emission sound pressure level at operator's position — Stationary test conditions*

ISO 6394:2008/Cor 1:2009, *Earth-moving machinery — Determination of emission sound pressure level at operator's position — Stationary test conditions — Technical Corrigendum 1*

ISO 6405-2:2017, *Earth-moving machinery — Symbols for operator controls and other displays — Part 2: Symbols for specific machines, equipment and accessories*

ISO 8813:1992, *Earth-moving machinery — Lift capacity of pipelayers and wheeled tractors or loaders equipped with side boom*

ISO 10968:2020, *Earth-moving machinery — Operator's controls*

ISO 16625:2013, *Cranes and hoists — Selection of wire ropes, drums and sheaves*

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 pipelayers is specified in ISO 7136:2006 and illustrated in Annex B 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
pipelayer
self-propelled crawler or wheeled machine, having pipe-laying equipment with main frame, a load-hoist mechanism, vertically pivotable side boom, and counterweight, primarily designed to handle and lay pipes

[Source: EN ISO 6165:2012]

3.2
hoisting limiter
hoist mechanism
positive locking device to prevent inadvertent lowering of the boom and an automatic means to stop the boom motion when the maximum permissible height is reached shall both be provided, as defined in ISO 8813:1992

4 Safety requirements and/or protective/risk reduction measures

4.1 General

4.1.1 Context

Pipelayers 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

Pipelayers 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 pipelayers the corresponding hazard does not exist. For pipelayers 4.2.2, 4.4.2, 4.5.10, 4.7.3, 4.10, 4.14.2.3, 4.22.5, 4.23, 4.24, Annex B and Annex D in EN 474-1:2022, are not applicable.

4.2 Operator's station

4.2.1 General

EN 474-1:2022, 4.3 shall apply with the addition stated in 4.2.2 below.

4.2.2 Window(s)

EN 474-1:2022, 4.3.2.5 shall apply with the addition that pipelayers shall be provided with motorised wiper(s) and washer in the travelling and lifting (e.g. side boom application) directions.

4.3 Seat

4.3.1 General

EN 474-1:2022, 4.4.1.4 shall apply with the addition stated in 4.3.2 below.

4.3.2 Vibration

Pipelayers with measured RMS-values on Z-axis, in accordance with EN 1032:2003+A1:2008, higher than 0,5 m/s^2 shall be equipped with a suspended seat complying with EN ISO 7096:2020 class EM6. As an alternative without testing the machine, the pipelayers shall be equipped with a suspended seat complying with EN ISO 7096:2020 class EM6.

NOTE RMS means root mean square.

4.4 Operator's controls and indicators

4.4.1 General

EN 474-1:2022, 4.5 applies with the following modifications in 4.4.2 below.

4.4.2 Emergency attachment lowering (Free fall function)

The emergency device to release the load shall be reachable by the operator within the cabin, according to EN ISO 6682:2008.

The free fall function should be used only for emergency purposes and not for normal working purposes (e.g. fast lowering).

4.5 Visibility

EN 474-1:2022, 4.8 applies with the following additions:

Means shall be provided to ensure operator visibility to the pipe area from the operator station during the lifting, translation operations and combination of both.

This requirement may be fulfilled either e.g.:

— by providing a seat turned to the direction of the boom, or

— by providing a slewable and lockable seat to the direction of the boom.

4.6 Lifting operation

4.6.1 General

EN 474-1:2022, 4.12 shall apply with the additions stated in 4.6 of this document.

4.6.2 Lifting capacity

Lifting equipment shall meet all the requirements in ISO 8813:1992.

4.6.3 Load lowering speed

A device to control the lowering speed of the boom and the hook shall be fitted so that the operator can control movement of the load with modulation and is able to stop the load at all load conditions up to and including rated lift capacity during normal operating conditions.

NOTE Emergency attachment lowering is covered in 4.4.2 of this document.

4.6.4 Pipe laying brakes

The pipe laying system shall be fitted with brakes which can be released by controls and automatically applied when the operator stops actuating or when the power source fails. The brakes shall be designed to withstand 1,5 times the rated lift capacity under conditions specified by the manufacturer.

4.6.5 Hooks

Hooks shall withstand a test load of 2 times the working load limit (WLL) without permanent deformation and a breaking force (BF) of 4 times the WLL according to EN 1677-1:2000+A1:2008 and EN 1677-2:2000+A1:2008.

Hooks also used for applications other than pipelaying (e.g. transport or holding of special tooling equipment) shall have a safety latch according to EN 1677-2:2000+A1:2008.

Handles shall be provided on hook blocks to remove the need to approach the trapping areas.

4.6.6 Ropes

Ropes shall be selected according to ISO 16625:2013.

4.6.7 Load capacity indicator

EN 474-1:2022, 4.12.4 applies with the following additions:

— The load capacity indicator shall take in account the ground slope condition and provide information about weight of load and rated capacity.

— The load capacity indicator shall warn visually the operator and the workers when the load reaches 85 % of the rated lifting capacity of the pipelayer (see 4.6.2) as defined in ISO 8813:1992.