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Mobile elevating work platforms — Design, calculations, safety requirements and test methods

Plates-formes élévatrices mobiles de personnel — Conception, calculs, exigences de sécurité et méthodes d'essai

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 214, *Elevating work platforms*.

This third edition cancels and replaces the second edition (ISO 16368:2010), which has been technically revised.

The main changes are as follows:

— all requirements from ISO 16653-1 have been integrated into this document;

— in the Scope, additional details have been added included intended use and objectives;

— the normative references have been updated;

— in Clause 3, seven new definitions have been added to support their use in the text;

— Clause 4 has been updated to include a new figure for the rated load of tools and materials; Table 1 and Figure 3 have been revised to show load-sensing and enhanced stability examples separately and to include more working configurations; verification methods have been removed from each clause and placed in new Table 7 in Clause 5; access system requirements have been revised to include Table 4 and Table 5;

— in Clause 6, the contents of Annex F have been merged into 6.2.1 and the previous Annex F has been deleted.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

This document is a type-C standard as stated in 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 organisations, 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 disabilities);

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

— consumers (in the 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.

The objective of this document is to establish rules for safeguarding persons and objects against the risk of an accident associated with the operation of mobile elevating work platforms (MEWPs). MEWPs are assemblies of one or more sub-assemblies produced by one or more manufacturers. A MEWP is the product of activities that include design, production, and testing, as well as the provision of information on the MEWP itself.

This document does not repeat all the general technical rules applicable to every electrical, mechanical, or structural component. Its safety requirements have been developed on the basis that MEWPs are periodically maintained according to given instructions, working conditions, frequency of use and national or other regulations. It is assumed that MEWPs are checked for function before start of work, whether used daily or seldom used, and are not put into operation unless all the required control and safety devices are available and in working order. Where, for clarity, an example of a safety measure is given in the text, it is not intended as the only possible solution. Any other solution leading to the same risk reduction is permissible if an equivalent level of safety is achieved.

Annex A explains the choice of Beaufort Scale 6 as the maximum wind speed.

Annex B specifies additional requirements for wireless controls and control systems.

Annex C provides, in addition to those found in the body of this document, appropriate extracts from DIN 15020 (all parts) to avoid the unexplained inconsistencies in coefficients of utilization for wire ropes found in other standards for lifting devices.

Annex D provides a worked example of the provisions given in Annex C.

Annex E gives kerb test calculations.

Annex F presents the list of significant hazards dealt with by this document.

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Mobile elevating work platforms — Design, calculations, safety requirements and test methods

1 Scope

This document specifies safety requirements and protective/risk reduction measures, and the means for their verification, for all types and sizes of mobile elevating work platforms (MEWPs) intended for moving a person(s) along with their necessary tools and materials at an elevated work location.

This document also applies to MEWPs designed for applications requiring special access to specific work areas. These MEWPs can be either self-propelled or manually propelled and are used to elevate personnel to a level at which they can place, install, or retrieve objects or material on a routine basis. To facilitate operator access to the work area, the retraction of a portion of the MEWP's work platform guardrail system(s) can be necessary.

This document is intended to serve as a guide for manufacturers and remanufacturers of MEWPs to achieve the following objectives:

— elimination or reduction of accidents and personal injuries;

— establishment of criteria for design, manufacture, remanufacture, rebuild/recondition, testing and performance;

— establishment and understanding by manufacturers and remanufacturers of their responsibilities.

The design and manufacturing requirements of this document apply to all MEWPs manufactured or remanufactured on or after the effective date, but it is not applicable to rebuilt or reconditioned MEWPs.

It identifies the hazards arising from the use of MEWPs and describes methods for the elimination or reduction of these hazards.

This document is not applicable to

a) permanently installed personnel-lifting appliances serving defined levels,

b) firefighting and fire rescue appliances (see for example, EN 1777),

c) unguided work cages suspended from lifting appliances (see for example, EN 1808),

d) elevating operator position on rail-dependent storage and retrieval equipment (see for example, EN 528),

e) tail lifts (see for example, EN 1756-1:2001+A1:2008, EN 1756-2:2004+A1:2009),

f) mast-climbing work platforms (see ISO 16369),

g) fairground equipment,

h) lifting tables with a lifting height of less than 2 m (see for example, EN 1570-1:2011+A1:2014),

i) builder's hoists for persons and materials,

j) aircraft ground-support equipment (see for example, EN-1915-1:2013, EN-1915-2:2001+A1:2009),

k) digger derricks,

l) elevating operator positions on industrial trucks (see for example, ISO 3691-3),

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m) elevating operator positions on cranes,

n) certain requirements for insulating aerial devices on a chassis for use in live work on electrical installations (see Note 1),

o) multi-purpose elevating platform powered industrial trucks (MPEPs) controlled by a single stand-up riding operator and intended to be used for manually picking and transporting small items at height,

p) powered industrial trucks used to pick and place stock or inventory.

NOTE 1 For requirements for use near live electrical installations, see ISO 16653-2. For requirements for use on live electrical installations, see IEC 61057.

It does not cover hazards arising from:

— use in potentially explosive atmospheres,

— use of compressed gases for load-bearing components,

— derailment and runaway of rail-mounted MEWPs,

— work on live electrical systems (see Note 2 and Note 3).

NOTE 2 Hazards arising from work on live electrical systems are addressed in IEC 61057.

NOTE 3 For MEWPs that employ aerial devices used for live working, this document is to be used in conjunction with IEC 61057, taking into consideration the potential exceptions from this document that are specified in IEC 61057.

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.

ISO 3864 (all parts), *Graphical symbols — Safety colours and safety signs*

ISO 4305, *Mobile cranes — Determination of stability*

ISO 7000, *Graphical symbols for use on equipment — Registered symbols*

ISO 12100, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

ISO 13849-1, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

ISO 13850, *Safety of machinery — Emergency stop function — Principles for design*

ISO 13854, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body*

ISO 18893:—[1)], *Mobile elevating work platforms — Safety principles, inspection, maintenance, and operation*

ISO 20332, *Cranes — Proof of competence of steel structures*

ISO 21455, *Mobile elevating work platforms — Operator's controls — Actuation, displacement, location and method of operation*

IEC 60068-2-64, *Environmental testing — Part 2-64: Tests — Test Fh: Vibration, broadband random and guidance*

IEC 60204-1, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

IEC 60204-32:2023, *Safety of machinery — Electrical equipment of machines — Part 32: Requirements for hoisting machines*

1) Under preparation. Stage at the time of publication: ISO/FDIS 18893:2024.

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IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 61310-1, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, acoustic and tactile signals*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100 and the following apply.

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

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

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

3.1
access position
position(s) to provide access to and from the *work platform* (3.58)

Note 1 to entry: The access position, *lowered travel position* (3.21), *stowed position* (3.51) and *transport position* (3.52) can be identical.

3.2
aerial device
device, extensible, articulating or both, which is primarily designed and used to position personnel

Note 1 to entry: This does not include the *chassis* (3.5). When an aerial device is mounted on a mobile *chassis* (3.5) it becomes a component of a MEWP. This device can also be used to handle material, if designed and equipped for that purpose.

3.3
anchorage
designated point of attachment utilized with a personal fall protection system

3.4
chain drive system
system that comprises one or more chains running on chain sprockets or over chain pulleys, as well as any associated chain sprockets, chain pulleys and compensating pulleys

3.5
chassis
base of a MEWP

Note 1 to entry: See Figure 1.

Note 2 to entry: The chassis can be pulled, pushed, self-propelled, etc.

3.6
ductile materials
materials that have a minimum elongation at fracture of 10 % in a gauge length of 51 mm of a standard tensile test specimen

3.7
elevated travel position
configuration(s) of the MEWP for travel outside of the *lowered travel position* (3.21)

3.8
extending structure
structure which is connected to the *chassis* (3.5) and supports the *work platform* (3.58) and which allows movement of the *work platform* (3.58) to its required position

Note 1 to entry: See Figure 1.

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