



SLOVENSKI STANDARD SIST EN 280:2013

01-december-2013

Nadomešča:

SIST EN 280:2002+A2:2009

**Premične dvizne delovne ploščadi - Konstrukcijski izračuni - Merila stabilnosti -
Konstrukcijske izvedbe - Varnost - Pregledi in preskusi**

Mobile elevating work platforms - Design calculations - Stability criteria - Construction -
Safety - Examinations and tests

Fahrbare Hubarbeitsbühnen - Berechnung - Standsicherheit - Bau - Sicherheit -
Prüfungen

Plates-formes élévatrices mobiles de personnel - Calculs de conception - Critères de
stabilité - Construction - Sécurité - Examens et essais

Ta slovenski standard je istoveten z: EN 280:2013

ICS:

53.020.99 Druga dvigalna oprema Other lifting equipment

SIST EN 280:2013

en,fr,de

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 280:2013

<https://standards.iteh.ai/catalog/standards/sist/a42167c5-9adb-4f98-9217-fbd3a887bae7/sist-en-280-2013>

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 280

July 2013

ICS 53.020.99

Supersedes EN 280:2001+A2:2009

English Version

Mobile elevating work platforms - Design calculations - Stability criteria - Construction - Safety - Examinations and tests

Plates-formes élévatrices mobiles de personnel - Calculs de conception - Critères de stabilité - Construction - Sécurité - Examens et essais

Fahrbare Hubarbeitsbühnen - Berechnung - Standsicherheit - Bau - Sicherheit - Prüfungen

This European Standard was approved by CEN on 21 May 2013.

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, Former Yugoslav Republic of Macedonia, 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.

[SIST EN 280:2013](https://standards.iteh.ai/catalog/standards/sist/a42167c5-9adb-4f98-9217-fbd3a887bae7/sist-en-280-2013)

<https://standards.iteh.ai/catalog/standards/sist/a42167c5-9adb-4f98-9217-fbd3a887bae7/sist-en-280-2013>



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

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

	Page
Foreword.....	4
Introduction	6
1 Scope.....	7
2 Normative references.....	8
3 Terms and definitions	9
4 List of hazards.....	14
5 Safety requirements and/or measures	19
5.1 General	19
5.2 Structural and stability calculations.....	19
5.2.1 General	19
5.2.2 Loads and forces	19
5.2.3 Determination of loads and forces	19
5.2.4 Stability calculations.....	21
5.2.5 Structural calculations.....	23
5.3 Chassis and stabilisers.....	37
5.3.1 Chassis.....	37
5.3.2 Stabilisers.....	41
5.4 Extending structure	42
5.5 Extending structure drive systems.....	46
5.5.1 General	46
5.5.2 Wire rope drive systems	47
5.5.3 Chain drive systems	49
5.5.4 Lead-screw drive systems.....	50
5.5.5 Rack and pinion drive systems	50
5.6 Work platform.....	51
5.7 Controls.....	54
5.8 Electrical equipment	55
5.9 Hydraulic systems.....	56
5.10 Hydraulic cylinders	58
5.11 Safety devices	62
6 Verification of the safety requirements and/or measures	64
6.1 Examinations and tests	64
6.1.1 General	64
6.1.2 Design check.....	64
6.1.3 Manufacturing check	64
6.1.4 Tests	65
6.2 Type tests of MEWPs	70
6.3 Tests before placing on the market.....	70
7 Information for use.....	70
7.1 Instruction handbook.....	70
7.2 Marking.....	74
Annex A (informative) Use of MEWPs in wind speeds greater than 12,5 m/s (Beaufort-Scale).....	76
Annex B (informative) Dynamic factors in stability and structural calculations	77
B.1 Stability calculations.....	77
B.2 Structural calculations.....	77
Annex C (normative) Calculation of wire rope drive systems.....	78
C.1 General	78
C.2 Calculation of wire rope drive systems.....	78
C.3 Calculation of rope diameters (coefficient c).....	79

C.4	Calculation of the diameters of rope drums, rope pulleys and compensating pulleys [coefficient ($h_1 \cdot h_2$)]	79
C.5	Efficiency of wire rope drive systems	82
Annex D	(informative) Calculation example - Wire rope drive systems	84
D.1	Method used to determine the coefficients and ratios used for 5.5.2 (wire rope drive systems) using the load cycle figures in 5.2.5.3 and operating speeds in 5.4.5	84
D.2	Calculation of the diameters of rope drums, pulleys and static pulleys	87
Annex E	(informative) Calculation examples - factor "z", kerb test	90
Annex F	(normative) Additional requirements for wireless controls and control systems	92
F.1	General	92
F.2	Control limitation	92
F.3	Stop	92
F.4	Serial data communication	92
F.5	Use of more than one operator control station	93
F.6	Battery-powered operator control stations	93
F.7	Receiver	93
F.8	Warnings	93
F.9	Information for use	93
Annex G	(normative) Dimensions of steps and ladders	94
Annex ZA	(informative) Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC	96
Bibliography	97

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 280:2013

<https://standards.iteh.ai/catalog/standards/sist/a42167c5-9adb-4f98-9217-fbd3a887bae7/sist-en-280-2013>

EN 280:2013 (E)**Foreword**

This document (EN 280:2013) has been prepared by Technical Committee CEN/TC 98 "Lifting platforms", 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 January 2014, and conflicting national standards shall be withdrawn at the latest by January 2015.

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

This document supersedes EN 280:2001+A2:2009.

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.

For relationship with EU Directive, see informative Annex ZA, which is an integral part of this document.

EN 280:2013 includes the following major changes with respect to EN 280:2001+A2:2009:

- Entry 1.4: the groups into which MEWPs are divided have been précised;
- Subclause 5.3 "Chassis and stabilisers" has been totally restructured and new requirements have been added;
- Entry 5.3.1.2: requirements for inclination have been reviewed;
- Entry 5.3.1.18: requirements for rail mounted MEWPs have been included;
- Subclause 5.3.2.3: requirements for MEWPs equipped with one or more oscillating axles have been included;
- Entry 5.4.1.7: variable working envelope by manual selection of more than one rated load has been précised;
- Entry 5.6.1: adjustments of the platform levels have been included;
- Entry 5.6.3: on work platforms with fixed guard handrails minimum dimensions of openings for the purpose of access to it have been added;
- Entry 5.6.14: "Anchorage(s) for the connection of a restraint device" has been added;
- Entry 5.6.15: requirements with regard to vibrations have been included;
- Entry 5.6.16: requirements for protection of operators on the platform have been added;
- Entry 5.6.17: requirements for "Exchangeable work platforms" have been included;
- Entry 5.7.9 "Overriding of emergency stops respectively safety functions..." has been totally revised;
- Subclause 5.11: for safety-related parts of control systems (SRP/CS) that perform the relevant safety function the references to categories according to EN 954-1 (see Table 4) have been replaced by references to performance levels according to EN ISO 13849-1;

- Subclause 6.1.4.2: requirements for platform with extension have been added;
- New Annex F "Additional requirements for wireless controls and control systems" has been added.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 280:2013](https://standards.iteh.ai/catalog/standards/sist/a42167c5-9adb-4f98-9217-fbd3a887bae7/sist-en-280-2013)

<https://standards.iteh.ai/catalog/standards/sist/a42167c5-9adb-4f98-9217-fbd3a887bae7/sist-en-280-2013>

Introduction

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

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

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.

The object of this European Standard is to define rules for safeguarding persons and objects against the risk of accidents associated with the operation of Mobile Elevating Work Platforms (MEWPs).

- This European Standard does not repeat all the general technical rules applicable to every electrical, mechanical or structural component.
- The safety requirements of this European Standard have been drawn up on the basis that MEWPs are periodically maintained according to manufacturers' instructions, working conditions, frequency of use and national regulations.

It is also assumed that MEWPs are checked for function daily before start of work and are not put into operation unless all required control and safety devices are available and in working order.

If a MEWP is seldom used, the checks may be made before start of work.

Furthermore it is assumed that persons on the work platform in case of power supply failure are not incapacitated and can assist in the emergency lowering.

- As far as possible this European Standard sets out only the requirements that materials and equipment need to meet in the interest of safety, and it is assumed that persons operating MEWPs are adequately trained.
- Where for clarity an example of a safety measure is given in the text, this does not need to be considered as the only possible solution. Any other solution leading to the same risk reduction is permissible if an equivalent level of safety is achieved.
- As no satisfactory explanation could be found for the dynamic factors used for stability calculations in previous national standards, the results of the tests carried out by the former CEN/TC 98/WG 1 to determine a suitable factor and stability calculation method for MEWPs have been adopted. The test method is described in Annex B (informative) as a guide for manufacturers wishing to use higher or lower operating speeds and to take advantage of developments in control systems.

Similarly, to avoid the unexplained inconsistencies in coefficients of utilisation for wire ropes found in other standards for lifting devices, appropriate extracts of the widely accepted standard DIN 15020-1 have been taken into 5.5.2 and Annex C (normative) with a worked example in Annex D (informative).

1 Scope

1.1 This European Standard specifies safety requirements and measures for all types and sizes of Mobile Elevating Work Platform (MEWP, see 3.1) intended to move persons to working positions where they are carrying out work from the work platform (WP) with the intention that persons are getting on and off the work platform only at access positions at ground level or on the chassis.

NOTE Machines designed for the handling of goods which are equipped with work platforms as interchangeable equipment are regarded as MEWPs.

1.2 This European Standard is applicable to the structural design calculations and stability criteria, construction, safety examinations and tests before MEWPs are first put into service. It identifies the hazards arising from the use of MEWPs and describes methods for the elimination or reduction of these hazards.

It does not cover the hazards arising from:

- a) use in potentially explosive atmospheres;
- b) electromagnetic incompatibility;
- c) work from the platform on external live electric systems;
- d) use of compressed gases for load bearing components;
- e) getting on and off the work platform at changing levels;
- f) specific applications (e.g. railway, ships) covered by National or local regulations.

1.3 This European Standard does not apply to:

- a) machinery serving fixed landings (see e.g. EN 81-1 and EN 81-2, EN 12159);
- b) fire-fighting and fire rescue appliances (see e.g. EN 1777);
- c) unguided work cages suspended from lifting appliances (see e.g. EN 1808);
- d) elevating operator position on rail dependent storage and retrieval equipment (see EN 528);
- e) tail lifts (see EN 1756-1 and EN 1756-2);
- f) mast climbing work platforms (see EN 1495);
- g) fairground equipment;
- h) lifting tables (see EN 1570-1);
- i) aircraft ground support equipment (see e.g. EN 1915-1 and EN 1915-2);
- j) elevating operator positions on industrial trucks (see EN 1726-2).

1.4 Classification:

MEWPs are divided into two main groups:

- a) Group A: MEWPs where the vertical projection of the centre of the area of the platform in all platform configurations at the maximum chassis inclination specified by the manufacturer is always inside the tipping lines.
- b) Group B: All other MEWPs.

EN 280:2013 (E)

Relating to travelling, MEWPs are divided into three types:

- 1) Type 1: Travelling is only allowed with the MEWP in its transport configuration;
- 2) Type 2: Travelling with raised work platform is controlled from a point of control at the chassis;
- 3) Type 3: Travelling with raised work platform is controlled from a point of control at the work platform.

NOTE Type 2 and type 3 can be combined.

2 Normative references

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

EN 349, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body*

EN 12385-4, *Steel wire ropes — Safety — Part 4: Stranded ropes for general lifting applications*

EN 14033-1, *Railway applications — Track — Railbound construction and maintenance machines — Part 1: Technical requirements for running*

EN 14033-2:2008+A1:2011, *Railway applications — Track — Railbound construction and maintenance machines — Part 2: Technical requirements for working*

EN 15746-1:2010+A1:2011, *Railway applications — Track — Road-rail machines and associated equipment — Part 1: Technical requirements for running and working*

EN 15954-1:2013, *Railway applications — Track — Trailers and associated equipment — Part 1: Technical requirements for running and working*

EN 15955-1:2013, *Railway applications — Track — Demountable machines and associated equipment — Part 1: Technical requirements for running and working*

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

EN 60204-1:2006, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:2005, modified)*

EN 60204-32:2008, *Safety of machinery — Electrical equipment of machines — Part 32: Requirements for hoisting machines (IEC 60204-32:2008)*

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

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

EN ISO 13849-1:2008, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2006)*

EN ISO 13849-2, *Safety of machinery — Safety related parts of control systems — Part 2: Validation (ISO 13849-2)*

EN ISO 13850, *Safety of machinery — Emergency stop — Principles for design (ISO 13850)*

EN ISO 13857, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857)*

ISO 3864-1, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs and safety markings*

ISO 4302, *Cranes — Wind load assessment*

ISO 4305, *Mobile cranes — Determination of stability*

ISO 4309, *Cranes — Wire ropes — Care and maintenance, inspection and discard*

3 Terms and definitions

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

3.1

mobile elevating work platform

MEWP

mobile machine that is intended to move persons to working positions where they are carrying out work from the work platform with the intention that persons are getting on and off the work platform only at access positions at ground level or on the chassis and which consists as a minimum of a work platform with controls, an extending structure and a chassis

3.2

work platform

fenced platform or a cage which can be moved under load to the required working position and from which erection, repair, inspection or similar work can be carried out

Note 1 to entry: See Figure 1.

3.3

extending structure

structure which is connected to the chassis and supports the work platform and which allows movement of the work platform to its required position

Note 1 to entry: See Figure 1.

Note 2 to entry: It may, for example, be a single or a telescoping or an articulating boom or ladder, or a scissors mechanism or any combination of them, and may or may not slew on the base.

3.4

chassis

base of the MEWP, which may be pulled, pushed, self-propelled, etc.

Note 1 to entry: See Figure 1.

3.5

stabilisers

devices and systems used to stabilise MEWPs by supporting and/or levelling the complete MEWP or the extending structure, e.g. jacks, suspension locking devices, extending axles

Note 1 to entry: See Figure 1.

3.6

access position

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

Note 1 to entry: Access position and transport configuration can be identical.

EN 280:2013 (E)

3.7
transport configuration
 configuration of the MEWP prescribed by the manufacturer in which the MEWP is intended to be delivered to the place of use

Note 1 to entry: Access position and transport configuration can be identical.

3.8
lowering
 operations to move the work platform to a lower level

Note 1 to entry: See Figure 2.

3.9
raising
 operations to move the work platform to a higher level

Note 1 to entry: See Figure 2.

3.10
rotating
 circular movement of the work platform about a vertical axis

Note 1 to entry: See Figure 2.

3.11
slewing
 circular movement of the extending structure about a vertical axis

Note 1 to entry: See Figure 2.

3.12
travelling
 movements of the chassis with work platform out of transport configuration

Note 1 to entry: See Figure 2.

3.13
vehicle mounted MEWP
 MEWP where the chassis is a vehicle and where travelling controls are located within the cab of the vehicle

3.14
pedestrian controlled MEWP
 MEWP that has the controls for powered transport located so that they are capable of being operated by a person walking close to the MEWP

3.15
self-propelled MEWP
 MEWP that has the travelling controls located at the work platform

3.16
rated load
 load for which the MEWP has been designed for normal operation and which is composed of persons, tools and material acting vertically on the work platform

Note 1 to entry: A MEWP can have more than one rated load.

3.17
load cycle
 cycle starting from the access position, carrying out work and returning to the access position

3.18**wire rope drive system**

system that comprises one or more wire rope(s) running on rope drums and on or over rope pulleys as well as any associated rope drums, rope pulleys and compensating pulleys

3.19**chain drive system**

system that comprises one or more chain(s) running on chain sprockets and on or over chain pulleys as well as any associated chain sprockets, chain pulleys and compensating pulleys

3.20**type test**

test on the representative model of a new design or one incorporating significant changes to an existing design, carried out by or on behalf of the manufacturer or his authorised representative

3.21**totally manually operated MEWP**

MEWP with movement powered only by manual effort

3.22**rail mounted MEWP**

MEWP where travelling is guided by rails

3.23**load sensing system**

system of monitoring the vertical load and vertical forces on the work platform

Note 1 to entry: See 3.2.

(standards.iteh.ai)

Note 2 to entry: The system includes the measuring device(s), the way the measuring devices are incorporated in the machinery and the signal processing system. [SIST EN 280:2013](https://standards.iteh.ai/catalog/standards/sist/a42167c5-9adb-4f98-9217-fbd3a887bae7/sist-en-280-2013)

<https://standards.iteh.ai/catalog/standards/sist/a42167c5-9adb-4f98-9217-fbd3a887bae7/sist-en-280-2013>

3.24**moment sensing system**

system of monitoring the moment acting about the tipping line tending to overturn the MEWP

Note 1 to entry: The system includes the measuring device(s), the way the measuring devices are incorporated in the machinery and the signal processing system.

3.25**wireless control**

means by which the MEWP operator's commands are transmitted without any physical connection for at least part of the distance between the control console and the rest of the control system

3.26**self-revealing failure or fault**

failure or fault of a component where the failure or fault is apparent to the MEWP operator and can be revealed without the use of monitoring services

Note 1 to entry: Failure or fault may be apparent to the MEWP operator through:

- changes of operating characteristics, and/or
- visual evidence, and/or
- audible evidence, and/or
- other evidence.

EN 280:2013 (E)**3.27****working envelope**

space in which the work platform is designed to work within the specified loads and forces under normal operating conditions

Note 1 to entry: MEWPS can have more than one working envelope.

3.28**exchangeable work platform**

work platform according to 3.2 which is intended to be exchanged without using tools

Note 1 to entry: Such platforms may be of different sizes and/or capacities.

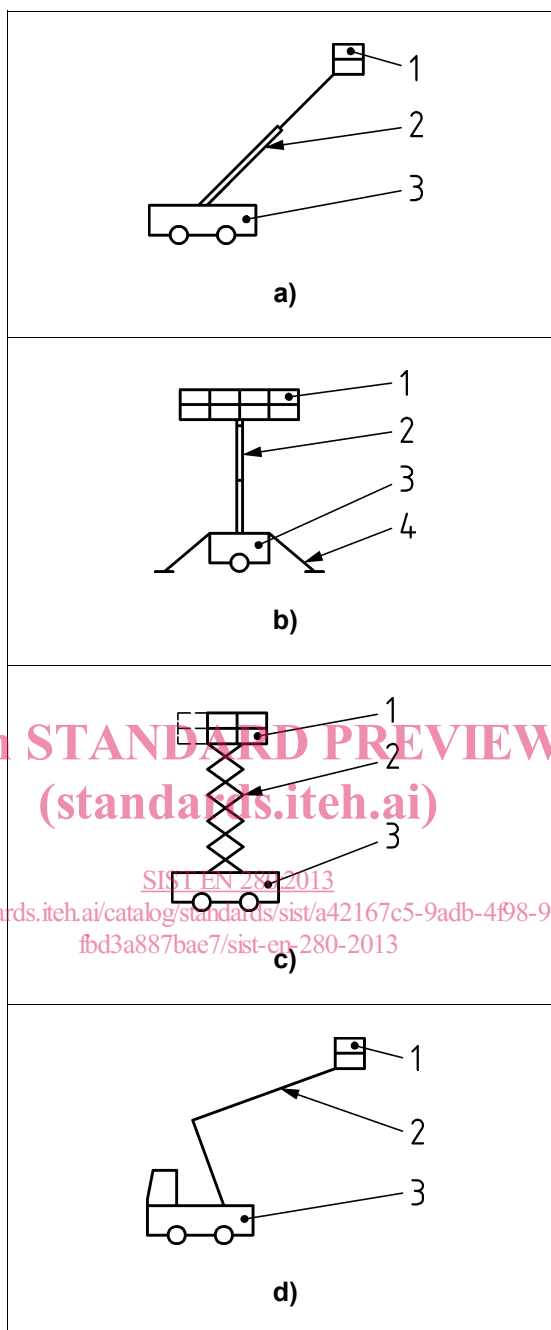
Note 2 to entry: Such platforms do not modify the original function of the MEWP.

Note 3 to entry: Work platforms which are interchangeable equipment intended to be fitted on machines other than MEWPs are not covered by this definition.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 280:2013](https://standards.iteh.ai/catalog/standards/sist/a42167c5-9adb-4f98-9217-fbd3a887bae7/sist-en-280-2013)

<https://standards.iteh.ai/catalog/standards/sist/a42167c5-9adb-4f98-9217-fbd3a887bae7/sist-en-280-2013>



iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 280:2013

<https://standards.iteh.ai/catalog/standards/sist/a42167c5-9adb-4f98-9217-fbd3a887bae7/sist-en-280-2013>

Key

- 1 work platform (see 3.2)
- 2 extending structure (see 3.3)
- 3 chassis (see 3.4)
- 4 stabilisers (see 3.5)

Figure 1 — Illustration of some definitions (1)