DRAFT INTERNATIONAL STANDARD

ISO/DIS 14122-4

ISO/TC **199** Secretariat: **DIN**

Voting begins on: **2014-01-16**

Voting terminates on: **2014-06-16**

Safety of machinery — Permanent means of access to machinery —

Part 4: Fixed ladders

Sécurité des machines — Moyens d'accès permanents aux machines —

Partie 4: Échelles fixes

[Revision of first edition (ISO 14122-4:2004) and of ISO 14122-4:2004/Amd 1:2010]

ICS: 13.110

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Reference number
ISO/DIS 14122-4:2013(E)

Contents

Page

Foreword v

Introduction vi

1 Scope 1

2 Normative references 1

3 Terms and definitions 2

4 Choice and design of ladder systems 5
4.1 Construction 5
4.1.1 Choice depending on available space 6
4.1.2 Spacing between the ladder and any permanent obstruction 6
4.2 Choice of a type fall protection device 6
4.2.1 Necessity of a fall protection device 6
4.2.2 Type of a fall protection device 6
4.2.3 Risk assessment for selection a suitable type of fall protection device 7
4.3 Height of ladder flights and selection criteria of a fall protection device 7
4.3.1 Limits of space and use 7
4.3.2 Ladder systems > 3m and ≤ 10 m total height *H* 9
4.3.3 Ladder systems > 10 m total height *H* 9
4.4 Platforms and landings 9
4.4.1 Necessity of platforms on arrival –and departure areas 9
4.4.2 Necessity on arrangement of platforms and landings 9
4.4.3 Selection of platforms and landings 9

5 Safety requirements of ladder systems 10
5.1 General requirements 10
5.1.1 Permanent action (dead load) 10
5.1.2 Variable action (rated load) 10
5.1.3 Additional and Accidental action 11
5.1.4 Design 13
5.2 Ladder with two stiles 13
5.2.1 Strength 13
5.2.2 Rungs 13
5.2.3 Connection of ladder and guard-rail 15
5.3 Ladder with one stile 15
5.3.1 Strength 15
5.3.2 Rungs 16
5.4 Departure and arrival areas 17
5.4.1 General Requirements 17
5.4.2 Departure area (entrance) 17
5.4.3 Arrival area (exit) 17
5.4.4 Access opening 18
5.4.5 Trap doors 19
5.5 Fall protection device 20
5.5.1 Safety cage 20
5.5.2 Specific requirements in the absence of a safety cage 24
5.5.3 Fall arrester 24
5.6 Platforms and landings 25
5.6.1 Access platforms 25
5.6.2 Intermediate platforms 25
5.6.3 Intermediate landings 26
5.6.4 Moveable rest landings 28
5.7 Requirements on moveable parts of fixed ladders 29

6 Verification of safety requirements 29
6.1 General 29
6.1.1 Verification of stability by calculation 29
6.1.2 Verification of stability by testing 29
6.2 Tests of fixed ladders with two stiles 30
6.2.1 Strength and bending of a ladder element 30
6.2.2 Test of safety cage 31
6.3 Test of ladders with one stile 32
6.3.1 Test of ladder elements 32

7 Information 34
7.1 Assembly instructions 34
7.2 Instruction for use 34
7.3 Operating instructions for ladders with fall arresters 34
7.4 Marking of ladder systems with fall arrester 35

Annex A (normative) Requirements on the design of anti-climb devices 36
A.1 General 36
A.2 Dimensions 38
A.3 Testing 39
A.3.1 General 39
A.3.2 Static test 39
A.3.3 Dynamic test for anti-climb devices for safety cages 39
A.3.4 Information for use 40

Annex B (informative) Significant technical changes between this Standard and the previous edition 41

Annex ZA (informative) Relationship between this European Standard and the Essential Requirement of EU Directive Machinery 2006/42/EC 44

Bibliography 45

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 14122-4 was prepared by Technical Committee ISO/TC 199, *Safety of machinery*, Subcommittee SC.

This second edition cancels and replaces the first edition which has been technically revised.

ISO 14122 consists of the following parts, under the general title *Safety of machinery — Permanent means of access to machinery*:

Part 1: Choice of fixed means of access

Part 2: Working platforms and walkways

Part 3: Stairs, stepladders and guard-rails

Part 4: Fixed ladders

Introduction

This document is a type-B standard as stated in 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 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 peoples 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.

In addition this document is intended for standardisation bodies elaborating type-C standards.

The requirements of this document can be supplemented or modified by a type-C standard.

For machines which are covered by the scope of a type-C standard and which have been designed and built according to the requirements of that standard, the requirements of that type-C standard take precedence.

The purpose of this standard is to define the general requirements for safe access to machines. This part of ISO 14122 gives advice about the correct choice of access means when the necessary access to the machine is not possible directly from the ground level or from a floor.

The dimensions specified are consistent with established ergonomic data given in ISO 15534-3, "*Ergonomic design for the safety of machinery —- Part 3: Anthropometric data"*

Safety of machinery — Permanent means of access to machinery — Part 4: Fixed ladders

1 Scope

This International Standard is applicable to stationary machinery where fixed means of access are necessary.

This part of ISO 14122 applies to fixed ladders which are a part of a machine.

ISO 14122 may also apply to means of access to that part of the building (e. g. working platforms, walkways, ladders) where the machine is installed, providing the main function of that part of the building is to provide a means of access to the machine.

NOTE 1 If no national standard or regulation is applicable this standard may be used also for means of access which are outside the scope of this standard.

This part applies to non-powered adjustable parts (e. g. foldable, slidable) and to the movable parts of fixed means of access.

This International Standard is not applicable to machinery manufactured before the date of its publication.

NOTE 2 For mobile machinery, due to their dimensions and particular conditions of use, specific requirements deviating from this standard can be applied. Therefore it is intended to develop a standard for mobile machinery excluding mobile machinery used in rough terrain. For access to mobile machinery used in rough terrain such earth moving machinery see ISO 2867 and for agriculture machinery see ISO 4254-1.

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.

EN 353-1, *Personal protective equipment against falls from a height — Part 1: Guided type fall arresters including a rigid anchor line*

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

ISO/DIS 14122-1:2013, *Safety of machinery — Permanent means of access to machinery — Part 1: Choice of fixed means of access between two levels*

ISO/DIS 14122-2:2013, *Safety of machinery — Permanent means of access to machinery — Part 2: Working platforms and walkways*

ISO/DIS 14122-3:2013, Safety of machinery — Permanent means of access to machinery — Part 3: s*tairs, stepladders and guard-rails*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100, ISO/DIS 14122-1:2013 and the following apply.

3.1
fixed ladder system
ladder system
installation of at least one ladder flight, fall protection(s) where appropriate as well as landing(s) and/or platform(s)

NOTE In the following text the abbreviation " ladder(s) " and " ladder flight(s)" will be used for fixed ladder(s) resp. fixed ladder flight(s)

3.2
ladder with two stiles
ladder, according to ISO/DIS 14122-1:2013, 3.1 which is stationary and where the rungs are arranged between and attached to the stiles. The stiles carry the load (see Figure 1)

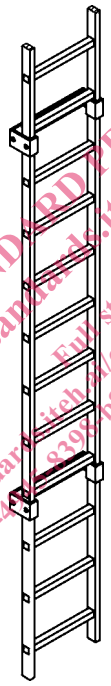


Figure 1 — ladder with two stiles

3.3
ladder with one stile
ladder, according to ISO/DIS 14122-1:2013, 3.1 which is stationary and where the rungs are attached to both sides of the stile. The stile carries the load alone (see Figure 2)

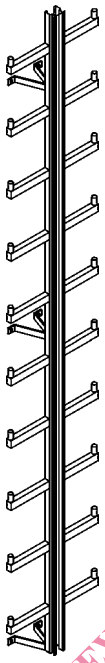


Figure 2 — ladder with one stile

3.4
ladder flight
continuous part of the fixed ladder (see Figures 3.a and 3.b):

— between departure and arrival area, in the case of ladders without platforms; or

— between the departurel area respectively arrival area and the nearest platform; or

— between landings or rest platforms following each other.

NOTE In german language commonly the term "Leiterzug" is used

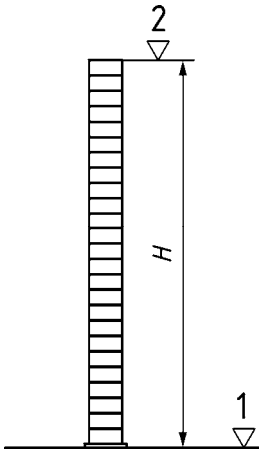


Figure 3.a — single ladder flight

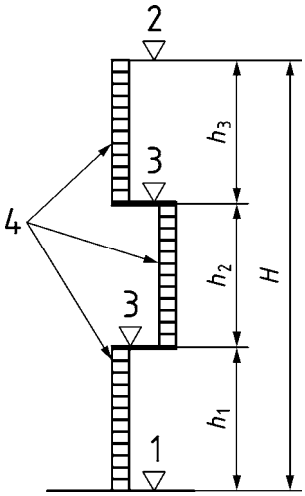


Figure 3.b — staggered ladder flights

Key

H	total height	*h*	height of a ladder flight
1	lower departure area	3	intermediate platform or intermediate landing
2	upper arrival area	4	ladder flight

Figure 3 — Height of flights and location of intermediate platforms/landings

3.5
climbing height of a ladder system
H
total vertical distance between the lower departure area and the arrival area on the top of a ladder system (see Figures 3.a and 3.b)

3.6
height of the ladder flight
h
vertical distance between the departure area and the arrival area of a ladder flight (see Figure 3a and 3b)

3.7
fall protection
technical measure to prevent or to minimize the risk of people falling from ladders

3.7.1
safety cage
cage-shaped protective device, fixed joined with the ladder, to minimize the risk of people falling from ladders (see Figures 13 and 15)

3.7.2
guided type fall arrester on a rigid anchorage line
fall arrester
protective equipment fixed to ladder used in combination with personal protective equipment that everyone has available before being allowed to use the ladder. (See also definition in EN 353-1 and EN 363)

NOTE In the following text the abbreviation "fall arrester" will also be used for this type of fall protection device.

3.8
departure area
entrance
lower level of the surroundings or of the intermediate platform from which, the person starts to climb the ladder (see Figures 3.a and 3.b)

3.9
arrival area
exit
upper level of the surroundings or of the intermediate platform to which, the person steps after the ascent (see Figure 3.a and 3.b)

3.10
intermediate landing
horizontal structure between two consecutive ladder flights (used with ladders having staggered flights) which is designed to change the ladder flights or to rest (see Figure 21)

3.11
intermediate platform
horizontal structure between two consecutive ladder flights which is designed to allow more than one person at same time change or to rest in the ladder system (see Figure 20)

3.12
rest landing
area equipped with the required protective means designed so that the user of the ladder system can have a physical rest but cannot interchange (see Figures 22.a and 22.b)

3.13
access platform
horizontal structure at the departure or arrival area used by a person for means of access to a ladder system

3.14
trap door
normally closed device which can be opened to give access through a platform or through other similar horizontal structures

NOTE In german language commonly the term "Durchstiegsklappe " is used

3.15
non-trained user
people without experience how to use the fall arrester

3.16
well-trained user
people with instruction and experience how to use the fall arrester (e.g. installer of wind turbine generator systems)

4 Choice and design of ladder systems

4.1 Construction

Ladder systems are designed with staggered flights or single flight.

If applicable the ladder system should be designed with two stiles. In exceptional cases (e.g. insufficient space for installation a ladder with two stiles or a continuous ladder system with an altering inclination angle) ladder systems with one stile may be foreseen.

4.1.1 Choice depending on available space

Minimum space can be achieved by using single flights.

Medium space is required when using adjoined staggered flights with landings.

Maximum space is required when staggered flights and intermediate platforms are applied.

4.1.2 Spacing between the ladder and any permanent obstruction

The space between the ladder and any permanent obstruction or obstacles (see Figure 4) shall be:

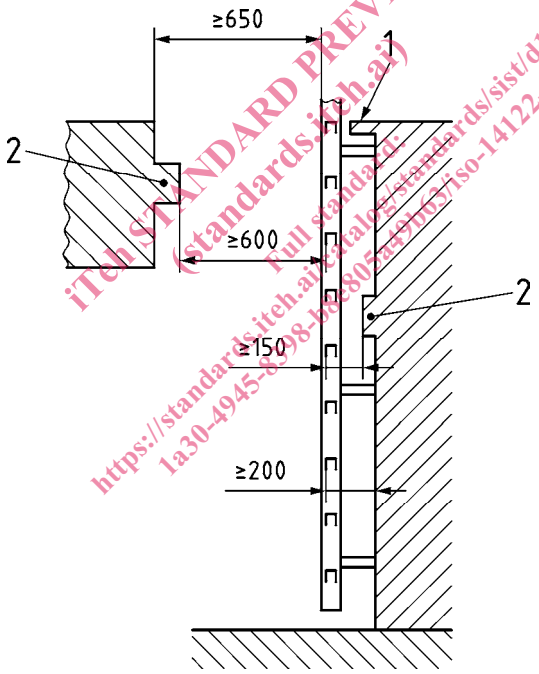
a) in front of the ladder:

at least 650 mm, in case of discontinues obstacles 600 mm.

b) behind the front of the rungs:

at least 200 mm, in case of discontinues obstacles 150 mm.

Dimensions in millimetres



Key
1 Arrival area
2 Discontinuous obstacle

Figure 4 — Space dimensions with permanent obstacles

4.2 Choice of a type fall protection device

4.2.1 Necessity of a fall protection device

In case of an overall falling height ≥ 3000 mm, the ladder shall be fitted with a fall protection device.

4.2.2 Type of a fall protection device

Two main alternatives for protection - the users of ladders against falling from a height are:

a) a safety cage, or

b) a guided type fall arrester on rigid anchorage line (fall arrester)

Due to rescue aspects a combination of both, safety cage and fall arrester, may not be applied.

4.2.3 Risk assessment for selection a suitable type of fall protection device

For the selection of a suitable type of fall protection device, a risk assessment in accordance with ISO 12100 shall be made for each particular application. The relevant aspects to be taken into account are, for example:

a) access conditions

   i) range restrictions, and

   ii) design restrictions

b) total climbing height for a fixed ladder;

c) quantum of risk of falling from height and expected severity of injuries;

d) human aspects, such as

   i) fatigue aspects,

   ii) stress-related aspects,

   iii) experience, ability und training (qualification);

e) rescue aspects

f) environmental aspects, such as

   i) wind, and

   ii) hot surface;

g) frequency of use

   i) occasional

   ii) common,

h) handling of

   i) tools, and

   ii) spare parts

4.3 Height of ladder flights and selection criteria of a fall protection device

4.3.1 Limits of space and use

Before provisions are be made for the height and the selection of a fall protection device (safety cage or fall arrester) it shall be considered (with regard of the limits of use in ISO 12100) whether the ladder system is used by well-trained or non-trained people.