



SLOVENSKI STANDARD

oSIST prEN 415-4:2019

01-marec-2019

Pakirne naprave - Varnost pakirnih naprav - 4. del: Stroji za nakladanje in razkladanje palet ter pripadajoča oprema

Safety of packaging machines - Part 4: Palletizers and depalletizers and associated equipment

Sicherheit von Verpackungsmaschinen - Teil 4: Palettierer und Depalettierer und zugehörige Ausrüstungen

Sécurité des machines d'emballage - Partie 4 : Palettiseurs, dépalettiseurs et équipement associé

[oSIST prEN 415-4:2019](https://standards.iteh.ai/catalog/standards/sist/b4e41c6a-45e5-4f85-ad30-415a77e4cf57/osist-pr-en-415-4-2019)

[https://standards.iteh.ai/catalog/standards/sist/b4e41c6a-45e5-4f85-ad30-](https://standards.iteh.ai/catalog/standards/sist/b4e41c6a-45e5-4f85-ad30-415a77e4cf57/osist-pr-en-415-4-2019)

[415a77e4cf57/osist-pr-en-415-4-2019](https://standards.iteh.ai/catalog/standards/sist/b4e41c6a-45e5-4f85-ad30-415a77e4cf57/osist-pr-en-415-4-2019)

Ta slovenski standard je istoveten z: prEN 415-4

ICS:

55.200

Pakirni stroji

Packaging machinery

oSIST prEN 415-4:2019

en,fr,de

iTeh STANDARD PREVIEW (standards.iteh.ai)

[oSIST prEN 415-4:2019](https://standards.iteh.ai/catalog/standards/sist/b4e41c6a-45e5-4f85-ad30-415a77e4cf57/osist-pren-415-4-2019)

<https://standards.iteh.ai/catalog/standards/sist/b4e41c6a-45e5-4f85-ad30-415a77e4cf57/osist-pren-415-4-2019>

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 415-4

January 2019

ICS 55.200

Will supersede EN 415-4:1997

English Version

**Safety of packaging machines - Part 4: Palletizers and
depalletizers and associated equipment**

Sécurité des machines d'emballage - Partie 4 :
Pallettiseurs et dépalettiseurs et équipement associé

Sicherheit von Verpackungsmaschinen - Teil 4:
Palettierer und Depalettierer und zugehörige
Ausrüstungen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 146.

If this draft becomes a European Standard, 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.

This draft European Standard was established by CEN 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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.



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

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

Contents

Page

European foreword.....	4
Introduction	5
1 Scope	6
2 Normative references	7
3 Terms and definitions	9
3.1 Definitions	9
3.2 Description of palletizers and depalletizers	10
3.3 Description of auxiliary equipment	11
3.4 Definition of zones	12
4 Hazards on palletizers, depalletizers and auxiliary equipment.....	14
4.1 General.....	14
4.2 Semiautomatic stripper plate palletizer.....	16
4.3 Automatic low level palletizer or depalletizer	17
4.4 High level palletizer and depalletizers.....	19
4.5 Pick and place palletizer and depalletizer and column pick and place palletizer or depalletizer	23
4.6 Robot palletizer or depalletizer.....	25
4.7 Case packer palletizer	27
4.8 Multi station palletizing system.....	28
4.9 Mechanical gripping head	31
4.10 Vacuum gripping head	32
4.11 Magnetic gripping head	33
4.12 Gripping head with roller curtain.....	34
4.13 Pallet stacker /destacker	36
4.14 Pallet changer.....	37
4.15 Grouping and ungrouping unit.....	38
4.16 Device for loading or unloading of layer pads.....	40
4.17 Pallet size/weight checker.....	41
4.18 Pallet condition checker	42
5 Safety requirements and/or protective measures for palletizers, depalletizers and associated equipment.....	43
5.1 General requirements	43
5.2 Safety requirement for semiautomatic stripper plate palletizer	56
5.3 Safety requirements for an automatic low level palletizer or depalletizer	56
5.4 Safety requirement for high level palletizer or depalletizer	57
5.5 Safety requirement for automatic column pick and place palletizer and depalletizer	58
5.6 Safety requirements for a robot palletizer or depalletizers	58
5.7 Requirement for a case-packer palletizer.....	59
5.8 Requirements for multi station palletizer served by AGV	59
5.9 Requirements for a mechanical gripping head	63
5.10 Requirements for vacuum gripping head.....	64
5.11 Requirements for a magnetic gripping head.....	64
5.12 Requirement for a roller curtain.....	65
5.13 Requirements for a pallet stacker/destacker	65
5.14 Requirements for a pallet changer	68

5.15	Requirements for pallets grouping and ungrouping machines.....	69
5.16	Requirements for device to insert or remove layer sheet.....	70
5.17	Requirements for a pallet size or weight checker	71
5.18	Requirements for a pallet condition checker.....	71
6	Verification of safety requirements and measures	71
6.1	General	71
6.2	Verification procedures	72
7	Information.....	74
7.1	General	74
7.2	Instruction.....	74
	Annex A (informative) Method for assessing the stability of loads staked on a pallet.....	75
A.1	General	75
A.2	Prevention of slipping.....	75
A.3	Prevention of overturn.....	76
A.4	Evaluation of the horizontal forces (<i>inertia effects</i>).....	77
	Annex B (normative) Noise test code	78
B.1	Introduction.....	78
B.2	Terms and definitions.....	78
B.3	General	78
B.4	Determination of emission sound pressure level at the work station.....	78
B.5	Determination of the sound power level	78
B.6	Alternative method for very large machines.....	79
B.7	Installation and mounting conditions.....	79
B.8	Operating conditions.....	79
B.9	Information to be recorded	79
B.10	Information to be reported.....	79
B.11	Declaration and verification of noise emission values	80
B.12	Typical measuring positions for sound pressure level.....	81
	Annex C (informative) Design criteria for the safety of multi station palletizer served by AGV.....	83
	Annex D (informative) Safety aspects for integrated palletizing system	84
	Annex ZA (informative) Relationship between this European Standard and the essential requirements of Directive 2006/42/EC aimed to be covered.....	86
	Bibliography	89

prEN 415-4:2018 (E)

European foreword

This document (prEN 415-4:2018) has been prepared by Technical Committee CEN/TC 146 “Packaging machines - Safety”, the secretariat of which is held by UNI.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 415-4:1997.

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 2006/42/EC.

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

This document is part of the series EN 415, *Safety of packaging machines*, which consists of the following parts:

- *Part 1: Terminology and classification of packaging machines and associated equipment;*
- *Part 2: Pre-formed rigid container packaging machines;*
- *Part 3: Form, fill and seal machines;*
- *Part 5: Wrapping machines;*
- *Part 6: Pallet wrapping machines;*
- *Part 7: Group and secondary packaging machines;*
- *Part 8: Strapping machine;*
- *Part 9: Noise measurement methods for packaging machines, packaging lines and associated equipment, grade of accuracy 2 and 3;*
- *Part 10: General requirements.*

ITeH STANDARD PREVIEW
(standards.iteh.ai)

EN 415-4:2019
<https://standards.iteh.ai/catalog/standards/sist/b4e41c6a-45e5-4f85-ad30-415a77e4cf57/osist-pren-415-4-2019>

Introduction

This document is a type C standard as defined in the introduction of ISO EN 12100:2010.

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

When provisions of this type C standard are different from those that are stated in type A or B standards, the provisions of this type C standard take precedence.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[oSIST prEN 415-4:2019](https://standards.iteh.ai/catalog/standards/sist/b4e41c6a-45e5-4f85-ad30-415a77e4cf57/osist-pren-415-4-2019)

<https://standards.iteh.ai/catalog/standards/sist/b4e41c6a-45e5-4f85-ad30-415a77e4cf57/osist-pren-415-4-2019>

prEN 415-4:2018 (E)

1 Scope

This document applies to the following groups of machines, auxiliary equipment and their combinations:

- palletizers;
- depalletizers;
- auxiliary equipment incorporated in or linked to the operations of palletizers and depalletizers;
- conveying system which are part of palletizers or depalletizers.

The individual machines are described in 3.2. Auxiliary equipment is described in 3.3.

For all packaging machines within the scope of this document, EN 415-10 also applies. EN 415-4 describes the additional or specific hazards for palletizers and depalletizers. The requirements of this document will take precedence over the requirements set out in EN 415-10.

This document deals with safety requirements for machine design, transport, installation, commissioning, operation, adjustment, maintenance and cleaning of palletizers, depalletizers, auxiliary equipment and conveying systems which are part of palletizer or depalletizer. The extent to which hazards, hazardous situations and events are covered are indicated in Clause 4.

NOTE The hazards on a specific machine can vary depending on its working principle, the type, size and mass of the product, the packaging material, auxiliary equipment attached to the machine and the environment in which the machine is used. If the machine presents hazards that are not covered by this document or EN 415-10, it is intended that the manufacturer will assess these hazards and take measures by using the principles detailed in EN ISO 12100.

Exclusions:

This document is not applicable to the following machines:

- machines where the layer is built manually on the pallet or pallet load without layer forming and layer transfer;
- machines that were manufactured before the date of publication of this document by CEN;
- conveyors that connect palletizers and depalletizers with machines that are not in the scope of this document.

Conveyors in the scope of this document also fall in the scope of EN 619.

This document describes the additional or specific hazards for conveyors fitted into palletizers and depalletizers and so the requirements of this document take precedence over the requirements of EN 619.

This document does not consider the following hazards:

- the use of palletizers and depalletizers in potentially explosive atmospheres;
- the health, safety or hygiene hazards associated with the products that are contained in the unit load handled by palletizers and depalletizers except with regard to possible malfunction of a machine causing spillage of hazardous substances.

2 Normative references

The following documents are referred to in the text in such a way that some or all 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 415-1:2014, *Safety of packaging machines - Part 1: Terminology and classification of packaging machines and associated equipment*

EN 415-9:2009, *Safety of packaging machines - Part 9: Noise measurement methods for packaging machines, packaging lines and associated equipment, grade of accuracy 2 and 3*

EN 415-10:2014, *Safety of packaging machines - Part 10: General Requirements*

EN 619:2002+A1:2010, *Continuous handling equipment and systems - Safety and EMC requirements for equipment for mechanical handling of unit loads*

EN 1005-3:2002+A1:2008, *Safety of machinery - Human physical performance - Part 3: Recommended force limits for machinery operation*

EN 13155:2003+A2:2009, *Cranes - Safety - Non-fixed load lifting attachments*

EN 60204-1:2016, *Safety of machinery - Electrical equipment of machines - Part 1: General requirements (IEC 60204-1:2016)*

EN 61496-1:2013, *Safety of machinery - Electro-sensitive protective equipment - Part 1: General requirements and tests (IEC 61496-1:2012)*

EN 61496-2:2013, *Safety of machinery - Electro-sensitive protective equipment - Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs) (IEC 61496-2:2013)*

EN 62061:2005, *Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems (IEC 62061:2005)¹⁾*

EN ISO 3744:2010, *Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for an essentially free field over a reflecting plane (ISO 3744:2010)*

EN ISO 3746:2010, *Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Survey method using an enveloping measurement surface over a reflecting plane (ISO 3746:2010)*

EN ISO 3747:2010, *Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering/survey methods for use in situ in a reverberant environment (ISO 3747:2010)*

EN ISO 4871:2009, *Acoustics - Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

1) This document is impacted by the amendments EN 62061:2005/A1:2013 and EN 62061:2005/A2:2015.

prEN 415-4:2018 (E)

EN ISO 9614-2:1996, *Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 2: Measurement by scanning (ISO 9614-2:1996)*

EN ISO 10218-1:2011, *Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots (ISO 10218-1:2011)*

EN ISO 10218-2:2011, *Robots and robotic devices - Safety requirements for industrial robots - Part 2: Robot systems and integration (ISO 10218-2:2011)*

EN ISO 11201:2010, *Acoustics - Noise emitted by machinery and equipment - Determination of emission sound pressure levels at a work station and at other specified positions in an essentially free field over a reflecting plane with negligible environmental corrections (ISO 11201:2010)*

EN ISO 11202:2010, *Acoustics - Noise emitted by machinery and equipment - Determination of emission sound pressure levels at a work station and at other specified positions applying approximate environmental corrections (ISO 11202:2010)*

EN ISO 11204:2010, *Acoustics - Noise emitted by machinery and equipment - Determination of emission sound pressure levels at a work station and at other specified positions applying accurate environmental corrections (ISO 11204:2010)*

EN ISO 11161:2007, *Safety of machinery - Integrated manufacturing systems - Basic requirements (ISO 11161:2007)²⁾*

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

EN ISO 12001:2009, *Acoustics - Noise emitted by machinery and equipment - Rules for the drafting and presentation of a noise test code (ISO 12001:1996)*

EN ISO 13849-1:2015, *Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1:2015)*

EN ISO 13855:2010, *Safety of machinery - Positioning of safeguards with respect to the approach speeds of parts of the human body (ISO 13855:2010)*

EN ISO 13857:2008, *Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2008)*

EN ISO 14122-2:2016, *Safety of machinery - Permanent means of access to machinery - Part 2: Working platforms and walkways (ISO 14122-2:2016)*

EN ISO 14122-3:2016, *Safety of machinery - Permanent means of access to machinery - Part 3: Stairs, stepladders and guard-rails (ISO 14122-3:2016)*

ISO 7010:2011, *Graphical symbols - Safety colours and safety signs - Registered safety signs*

²⁾ This document is impacted by the amendment EN ISO 11161:2007/A1:2010.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in Clause 3 of EN ISO 12100:2010, EN 415-1:2014, EN 415-10:2014 and the following apply.

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

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 Definitions

3.1.1

to palletize

operation of placing one or more unit loads on a pallet or similar support

3.1.2

to depalletize

separation of a palletized load into individual unit loads

3.1.3

layer

arrangement of unit loads in a horizontal plane

3.1.4

layer sheet

(layer pad or intermediate layer) sheet of material placed between layers to stabilize a pallet load

3.1.5

layer pattern

disposition of the unit loads in a layer

3.1.6

pallet

rigid horizontal platform designed to be handled by pallet trucks, fork-lift trucks or other appropriate handling equipment, and used as a base for assembling, loading, storing, handling, stacking, transporting, or displaying goods and loads.

Note 1 to entry: The pallet may be constructed with, or fitted with, a superstructure.

3.1.7

pallet load

arrangement of unit loads placed on a pallet or slip sheet

3.1.8

porous vacuum plate

plate made of porous material which holds a product by means of a vacuum

3.1.9

row

horizontal line of unit loads

iTeh STANDARD PREVIEW
(standards.iteh.ai)

oSIST prEN 415-4:2019
<https://standards.iteh.ai/catalog/standards/sist/b4e41c6a-45e5-4f85-ad30-415a77e4cf57/osist-pren-415-4-2019>

prEN 415-4:2018 (E)**3.1.10****slip sheet**

thin flat piece of material used to support a pallet load

3.1.11**stack**

vertical column of unit loads

3.1.12**integrator**

entity who designs, provides, manufactures or assembles an integrated manufacturing system and is in charge of the safety strategy, including the protective measures, control interfaces and interconnections of the control system.

Note 1 to entry: The integrator may be a manufacturer, engineering company or the user.

3.1.13**integrated palletizing system**

group of machines working together in a coordinated manner, linked by material handling system, and interconnected by controls for the purpose of palletize or depalletize pallets

3.2 Description of palletizers and depalletizers**3.2.1 General****iTeh STANDARD PREVIEW**

This clause describes the working principles of typical configurations of palletizers and depalletizers. Variations of these typical assemblies also exist.

3.2.2 Semi-automatic stripper plate palletizer

<https://standards.iteh.ai/catalog/standards/sist/b4e41c6a-45e5-4f85-ad30-415e77e4e577/prist-pr-en-415-4-2019>

An operator forms the unit loads into the layer pattern on a stripper plate manually and then presses a start button. The machine then transfers the layer on to the pallet, the stripper plate retracts, deposits the layer on the pallet and then returns to the layer forming position automatically.

3.2.3 Automatic low-level stripper plate palletizer or depalletizer

Layers of products are formed at one level, either at low or high level, transferred by pushing onto a stripper plate which raises or lowers to the appropriate level and transfers the layers onto the pallet. The pallet remains at one level while the pallet load is formed. For depalletizers, layers of packages are gripped and swept onto a stripper plate which moves to the level of a receiving table where the layer is deposited. The pallet remains in a fixed position while the pallet load is being dismantled.

3.2.4 Automatic high-level palletizer or depalletizer

Layers of packages are formed at one level usually a high level and transferred onto the pallet which is raised and then lowered as the pallet forms. A depalletizer operates in reverse: layers of packages are gripped and moved from a pallet onto a receiving table, usually positioned at high level. The height of the pallet is raised as the pallet is dismantled.

3.2.5 Pick and place palletizer or depalletizer (Gantry type)

Palletizer in which products are gripped, lifted, transferred to the loading position and then lowered onto the pallet load with linear movements and a rotation of the end effector.

NOTE The pallet/load remains at one level while it is being loaded.

3.2.6 Pick and place palletizer or depalletizer (Column type)

Pick-and-place palletizer in which the product lifting device is supported on a column and can move up and down the column or rotate around the column. A rotation of the end effector may also exist.

NOTE Column palletizers can pick up packages one at a time, or a row at a time, or a layer at a time. Unit loads are generally conveyed to the machine at low level but certain designs have an input of unit loads at high level. Typically, there is a spacing conveyor, an orientation device and a row or layer preparation table for unit loads. The column palletizer is suitable for systems where more than one pallet are loaded from one or more sources. Pallets are transported through the machine by a conveyor. The machine may combine the loading and unloading in a single compact installation.

3.2.7 Stack palletizer

Palletizer which creates stacks of packages, e.g. crates which are then transferred to the pallet as a group.

3.2.8 Robot palletizer and depalletizer

Palletizer or depalletizer which uses an industrial robot to perform some or all sequential operations for palletizing or depalletizing unit loads.

Robot palletizers can pick up products one at a time, a row at a time or a layer at a time. In some installations the robot also positions the pallet or the layer sheets

3.2.9 Case-packer-palletizer

A machine which combines the operations of case-packing and palletizing in one machine.

3.2.10 Multi-station palletizing system

Palletizer in which two or more pallet loads of products are formed in the same machine.

NOTE The pallet loads are loaded and/or unloaded by an industrial truck, e.g. AGV or fork lift truck or directly to a conveyor system.

3.3 Description of auxiliary equipment

3.3.1 General

This clause describes the working principle of typical auxiliary equipment used in palletizers and depalletizers.

3.3.2 Mechanical gripper

These have mechanical elements which support or clamp the unit load, set of products, empty pallet or layer sheet. The clamping action may employ the following methods:

- a) positive action;
- b) friction between the fingers or plates and the loads;
- c) friction between the loads;
- d) pressure by an inflatable element.

3.3.3 Vacuum gripping head

Product is lifted by several suction cups or by a porous vacuum plate which applies a vacuum to the surface of the product.

prEN 415-4:2018 (E)

3.3.4 Magnetic gripping head

Products made of magnetic material are lifted using electromagnetic force.

3.3.5 Gripping head with roller curtain

Products are transferred onto a roller curtain which is then lifted and **moved over** a pallet. The roller curtain is then retracted leaving the **products** on the pallet.

3.3.6 Pallet stacker/pallet destacker

The machine dispenses empty pallets from a stack or accepts single empty pallets and places them in a stack.

3.3.7 Pallet changer

The machine removes a pallet load from a pallet so that it can be placed on another pallet.

3.3.8 Pallets grouping and ungrouping units

Pallets are fed by a forklift truck onto a roller conveyor which stores, sorts and delivers the pallets to various loading stations. Pallets may turn and move in all directions. The system may handle empty or full pallets.

3.3.9 Device for insertion or removal of layer sheets

Machine or attachment which places layer sheets onto layers of products on the pallet; as the pallet load is formed or removes layer sheets as a pallet load is dismantled.

NOTE The layer sheet magazine can be inside the interior zone or in a separate control zone.

3.3.10 Pallet checkers

oSIST prEN 415-4:2019

[https://standards.iteh.ai/catalog/standards/sist/b4e41c6a-45e5-4f85-ad30-](https://standards.iteh.ai/catalog/standards/sist/b4e41c6a-45e5-4f85-ad30-415a77e4cf57/osist-pren-415-4-2019)

3.3.10.1 Pallet size/weight checker

415a77e4cf57/osist-pren-415-4-2019

This equipment may consist of a roller conveyor with load cells for weighing pallets, or another control station, usually equipped with photoelectric equipment, to check the size of the palletized load.

NOTE This equipment is often combined with a labelling machine or devices for the selection and sorting of the pallets. It is normally part of a palletizing system.

3.3.10.2 Pallet condition checker

This equipment checks various attributes of the pallet, e.g. presence of boards, free space or stringers in bad condition. If a pallet does not meet the quality requirements, it is rejected.

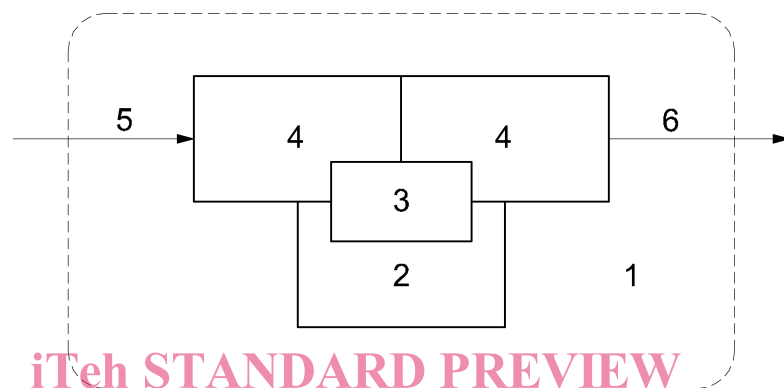
3.4 Definition of zones

The zones of a palletizer or depalletizer are classified in Figure 1 but may differ in the real situations. The zones are defined in the instruction manual and the inside zone shall be made evident with warning signals placed on the machine.

For the description of the safety measures it is useful to define the relevant zone of typical palletizer or depalletizer which, in general, are:

- 1) Open space (circulation zone): it is the space around the palletizers where the operators may be present, even not very often;
- 2) Operative zone (working zone): it is the space where the operators are present during normal operations (e.g. operator panel) and which is not safeguarded;

- 3) Part of the safeguarded zone which is not affected by hazards of zone 4 and is separated from zone 4 where operators, under safe condition, may have regular access for operations;
- 4) Safeguarded zone: it is the zone where the machine operates and where the major risks are present, and the operators are not present during normal operation. This zone may be divided in two or more sub-zones in order to establish requirement for safe access in a sub-zone while the others are in operation. This zone is also called "hazard zone". The safeguarded zone is defined by perimeter safeguards including ESPE;
- 5) Infeed zone: it is the space where the products enter in the inside zone. It may be more than one;
- 6) Outfeed zone: it is the space where the products exit the inside zone. It may be more than one.



Key

- 1 open space (circulation zone)
- 2 operative zones (working zone)
- 3 part of the safeguarded zone
- 4 safeguarded zone (interior zone)
- 5 infeed zone
- 6 outfeed zone

Figure 1 — Typical zones of palletizers