



Institut luxembourgeois de la normalisation
de l'accréditation, de la sécurité et qualité
des produits et services

ILNAS-EN 15620:2008

Steel static storage systems - Adjustable pallet racking - Tolerances, deformations and clearances

Systèmes de stockage statiques en acier -
Rayonnages à palettes réglables -
Tolérances, déformations et jeux

Ortsfeste Regalsysteme aus Stahl -
Verstellbare Palettenregale -
Grenzabweichungen, Verformungen und
Freiräume

10/2008



National Foreword

This European Standard EN 15620:2008 was adopted as Luxembourgish Standard ILNAS-EN 15620:2008.

Every interested party, which is member of an organization based in Luxembourg, can participate for FREE in the development of Luxembourgish (ILNAS), European (CEN, CENELEC) and International (ISO, IEC) standards:

- Participate in the design of standards
- Foresee future developments
- Participate in technical committee meetings

<https://portail-qualite.public.lu/fr/normes-normalisation/participer-normalisation.html>

THIS PUBLICATION IS COPYRIGHT PROTECTED

Nothing from this publication may be reproduced or utilized in any form or by any mean - electronic, mechanical, photocopying or any other data carries without prior permission!

EUROPEAN STANDARD ILNAS-EN 15620:2008 **EN 15620**
NORME EUROPÉENNE
EUROPÄISCHE NORM

October 2008

ICS 53.080

English Version

**Steel static storage systems - Adjustable pallet racking -
Tolerances, deformations and clearances**

Systèmes de stockage statiques en acier - Rayonnages à
palettes réglables - Tolérances, déformations et jeux

Ortsfeste Regalsysteme aus Stahl - Verstellbare
Palettenregale - Grenzabweichungen, Verformungen und
Freiräume

This European Standard was approved by CEN on 13 September 2008.

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 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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Contents

Page

| | |
|--|----|
| Foreword..... | 5 |
| Introduction | 6 |
| 1 Scope | 7 |
| 2 Normative references | 7 |
| 3 Terms and definitions | 8 |
| 4 Racking classes | 13 |
| 4.1 General..... | 13 |
| 4.2 Class 100, Stacker crane..... | 13 |
| 4.3 Class 200, Stacker crane..... | 14 |
| 4.4 Class 300, Very narrow aisle | 14 |
| 4.4.1 General..... | 14 |
| 4.4.2 Class 300A, Very narrow aisle | 15 |
| 4.4.3 Class 300B, Very narrow aisle | 15 |
| 4.5 Class 400, Wide aisle and narrow aisle | 15 |
| 4.5.1 Class 400, Wide aisle..... | 15 |
| 4.5.2 Class 400, Narrow aisle..... | 15 |
| 5 Wide aisle and narrow aisle - Class 400..... | 17 |
| 5.1 Floor tolerances | 17 |
| 5.1.1 Definition of E..... | 17 |
| 5.1.2 Limiting values for E | 18 |
| 5.2 Installation tolerances | 19 |
| 5.3 Deformation limits | 22 |
| 5.3.1 Floor deformations | 22 |
| 5.3.2 Beam deformation limits in the Y direction | 22 |
| 5.3.3 Frame deformations in the X and Z directions | 22 |
| 5.4 Clearances for unit loads and truck handling equipment | 22 |
| 5.4.1 Clearances relating to the placement of unit loads | 22 |
| 5.4.2 Horizontal lateral and vertical clearances in a bay | 23 |
| 5.4.3 Horizontal clearance in the depth | 25 |
| 5.4.4 Aisle width dimensions | 27 |
| 5.4.5 Clearances for gangways | 28 |
| 6 Very narrow aisle - Class 300 | 29 |
| 6.1 Floor tolerances | 29 |
| 6.1.1 Definition of E, Z and Z_{SLOPE} | 29 |
| 6.1.2 Definition dZ and dX | 29 |
| 6.1.3 Definition d^2Z and d^2X | 30 |
| 6.1.4 Limiting values of properties..... | 31 |
| 6.2 Installation tolerances | 32 |
| 6.2.1 General..... | 32 |
| 6.2.2 Tolerance field of frames in X direction | 36 |
| 6.3 Deformation limits | 36 |
| 6.3.1 Floor deformations | 36 |
| 6.3.2 Beam deformation limits in the Y direction | 36 |
| 6.3.3 Frame deformations | 37 |
| 6.3.4 Guide rail deformation | 37 |
| 6.4 Clearances for unit loads and truck handling equipment | 37 |
| 6.4.1 Clearances relating to the placement of unit loads | 37 |
| 6.4.2 Horizontal and vertical clearances in a bay | 38 |

| | | |
|---------|---|----|
| 6.4.3 | Horizontal clearance in the depth..... | 39 |
| 6.5 | Aisle width dimensions..... | 42 |
| 6.5.1 | Minimum aisle clearance for truck and load..... | 42 |
| 6.5.2 | Lowest unit load | 42 |
| 6.6 | Pick up and deposit stations..... | 42 |
| 7 | Stacker crane classes 100 and 200 | 42 |
| 7.1 | Floor tolerances..... | 42 |
| 7.1.1 | Interdependence of rack and crane on local floor level variation | 42 |
| 7.1.2 | Floor Levelness for stacker crane floors | 42 |
| 7.2 | Installation tolerances..... | 43 |
| 7.2.1 | General | 43 |
| 7.2.2 | Tolerance field of frames in X direction | 48 |
| 7.2.3 | Rail fabrication and assembly tolerances..... | 48 |
| 7.3 | Deformation limits | 49 |
| 7.3.1 | Slab deformation due to settling and slab deflection..... | 49 |
| 7.3.2 | Beam deformation limitations in the Y direction..... | 49 |
| 7.3.3 | Top guide rail deformations | 50 |
| 7.3.4 | Frame deformations in the X and Z directions | 51 |
| 7.3.5 | Frame deformations in the X and Z directions for clad rack buildings and wind loads | 52 |
| 7.3.6 | Elastic shortening of uprights | 54 |
| 7.4 | Clearances for unit loads and crane handling equipment..... | 54 |
| 7.5 | Safety backstop deformations | 54 |
| 7.5.1 | Deformations | 54 |
| 7.5.2 | Clearances | 54 |
| 8 | Warehouse tolerances and deformations..... | 54 |
| Annex A | (informative) Adjustable pallet racking components..... | 55 |
| Annex B | (informative) General safety philosophy..... | 57 |
| B.1 | General | 57 |
| B.2 | Wide and narrow aisle width manoeuvring clearance..... | 58 |
| B.3 | Intrusive stacking | 58 |
| B.4 | Environments with additional risk..... | 59 |
| B.5 | Truck requirements | 59 |
| B.6 | Floor tolerances and deformations | 60 |
| B.6.1 | General | 60 |
| B.6.2 | Sloping floors | 61 |
| B.6.3 | MHE lean..... | 61 |
| Annex C | (informative) Racking measurement surveys..... | 63 |
| C.1 | General | 63 |
| C.2 | Agreed grid lines and datum's | 63 |
| C.3 | Principal grid lines and datum's | 63 |
| C.4 | Measurement survey reports | 63 |
| C.4.1 | General | 63 |
| C.4.2 | Measuring conditions | 63 |
| Annex D | (informative) Effects of beam hogging and sagging deformations on clearances | 64 |
| D.1 | Effects of beam hogging and sagging deformations on clearances X_3 , X_4 and Y_1 , Y_2 and Y_3 for non cantilevered beams..... | 64 |
| D.2 | Effects of beam hogging and sagging deformations on X_3 , X_4 and Y_1 , Y_2 and Y_3 for cantilevered beams (P and D stations) | 68 |
| Annex E | (informative) Additional information for determining dimensions and clearances in the depth of the rack (Z direction)..... | 69 |
| E.1 | Placement tolerances in the depth of the rack..... | 69 |
| E.2 | Larger values of Z_{2a} and Z_{2b} | 70 |
| Annex F | (informative) Additional information for very narrow aisle trucks in adjustable pallet racking | 72 |
| F.1 | General | 72 |

| | | |
|---------------------|---|-----------|
| F.2 | Considerations for the Z direction | 72 |
| F.3 | Considerations in the Y direction | 73 |
| F.4 | Height selection device | 73 |
| F.5 | Pick up and deposit (P and D) stations | 73 |
| Annex G | (informative) Consideration of tolerances and deformations in determining clearances | 74 |
| G.1 | General | 74 |
| G.2 | Storage systems other than single deep adjustable pallet racking | 74 |
| Annex H | (informative) Top guide rail tolerance recommendations | 75 |
| Bibliography | | 76 |

Foreword

This document (EN 15620:2008) has been prepared by Technical Committee CEN/TC 344 “Steel static storage systems”, the secretariat of which is held by UNI.

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 April 2009, and conflicting national standards shall be withdrawn at the latest by April 2009.

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.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

The determination of the safe load bearing capacity of racking is a structural issue and therefore the Eurocodes are relevant, especially EN 1993. The most relevant parts for racking are EN 1993-1-1 and EN 1993-1-3.

In order to have reliable state of the art guidance for those involved in designing these products and due to the differences in the shape of the structural components, detailing and connection types, additional technical information to the Eurocodes is required.

The scope of CEN/TC 344 is to establish European Standards providing guidance for the specification, design, methods of installation, accuracy of build and also guidance for the user on the safe use of steel static storage systems.

This, together with the need for harmonised design rules, was the reason that the European Racking Federation (ERF) has taken the initiative for the CEN/TC 344. This TC is in the course of preparing a series of European Standards regarding Steel static storage systems as follows:

prEN 15512, *Steel static storage systems – Adjustable pallet racking systems – Principles for structural design*;

prEN 15629, *Steel static storage systems – The specification of storage equipment*;

prEN 15635, *Steel static storage systems – The application and maintenance of storage equipment*.

The intention is for these EN series to be published sequentially over a period of ten years.

1 Scope

This European Standard specifies tolerances, deformations and clearances that pertain to the production, assembly and erection of pallet racking including the interaction with floors. These tolerances, deformations and clearances are important in relation to the functional requirements and ensuring the proper interaction of the handling equipment used by personnel, trained and qualified as competent, in association with the specific type of racking system. The interaction conditions are also important in determining the reliability of the storage system to ensure that the chance of an industrial truck impact, pallet impact or a system breakdown is acceptably low. The design safety philosophy given in prEN 15512 is based upon compliance with this standard.

This European Standard gives guidance for a variety of issues including operating clearances, manufacturing, assembly and erection tolerance limitations, as well as deflection or strain deformation limitations under loads.

This European Standard is limited to single deep adjustable beam pallet racking operated with industrial trucks or stacker cranes. Drive-in, double deep and satellite systems will be considered for inclusion in the document in the future.

This European Standard specifically excludes the tolerances and deformation of the trucks and stacker cranes. It is the responsibility of the truck or stacker crane supplier and the client or user to ensure that the tolerances, deformations and clearances, as quoted in this European Standard for the racking systems, are acceptable for the safe operation of the overall system.

This European Standard gives guidance to be used in conjunction with the latest information from the truck and stacker crane suppliers regarding turning radii, tolerances and deformations of the truck and stacker cranes.

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.

prEN 15512 *Steel static storage systems – Adjustable pallet racking systems – Principles for structural design*

prEN 15629 *Steel static storage systems – The specification of storage equipment*

prEN ISO 3691-3, *Industrial trucks – Safety requirements and verification – Part 3: Additional requirements for trucks with elevating operator position and trucks specifically designed to travel with elevated loads (ISO/DIS 3691-3:2007)*