Génova, 6 28004 MADRID España Centralita 914 326 000 Fax 913 104 596

www.aenor.es

# RATIFICACIÓN DE DOCUMENTOS EUROPEOS ENERO 2016

#### **HOJA DE ANUNCIO**

En cumplimiento del punto 11.2.6.4 de las Reglas Internas de CEN/CENELEC Parte 2, se ha otorgado el rango de norma española al Documento Europeo siguiente:

Fecha de Disponibilidad	
Disponibilidad	
flamables. 2015-10-07	
e :	2016.)

Este anuncio causará efecto a partir del primer día del mes siguiente al de su publicación en la revista UNE. La correspondiente versión oficial de este documento se encuentra disponible en la sede de AENOR, Calle Génova 6, 28004 MADRID.

©...2015.. Derechos de reproducción reservados a los Miembros de CEN.

### EUROPEAN STANDARD NORME EUROPÉENNE EUROPÄISCHE NORM

**EN 1539** 

October 2015

ICS 25.180.01

Supersedes EN 1539:2009

#### **English Version**

## Dryers and ovens, in which flammable substances are released - Safety requirements

Séchoirs et fours dans lesquels se dégagent des substances inflammables - Prescriptions de sécurité

Trockner und Öfen, in denen brennbare Stoffe freigesetzt werden - Sicherheitsanforderungen

This European Standard was approved by CEN on 27 June 2015.

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.



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

© 2015 CEN All rights of exploitation in any form and by any means reserved worldwide for CEN national Members.

Ref. No. EN 1539:2015 E

Conte	ents	Page
Europe	ean foreword	5
Introd	uction	7
1	Scope	
2	Normative references	
3	Terms and definitions	
4	Significant hazards	
5	Safety requirements and/or protective measures	
5 5.1	GeneralGeneral	
5.2	Safety requirements against mechanical hazards	
5.2.1	Shearing, crushing, drawing-in	
5.2.2	Means of escape	
5.2.3	Safety requirements against slip and fall hazards	
5.3	Safety requirements against electrical hazards	
5.3.1	General	
5.3.2	Electrical equipment	
5.3.3	External influences on the electrical equipment	
5.4	Safety requirements against thermal hazards	
5.5	Safety requirements against noise hazards	24
5.6	Safety requirements against radiation hazards	24
5.7	Safety requirements against health hazardous substances	25
5.8	Fire protection and prevention	25
5.8.1	General	
5.8.2	Materials and construction	
5.8.3	Heating systems	
5.8.4	Prevention of ignition by hot surfaces	
5.8.5	Prevention of ignition by overheating	
5.8.6	Prevention of auto-ignition	
5.9	Explosion protection and prevention requirements	
5.9.1	General	
5.9.2	Type A-dryers	
5.9.3	Type B-dryers	
5.10	Control systems	
	General	
	Requirements for type A-dryersRequirements for type B-dryers	
5.10.3	1 71 7	
6	Verification of the safety requirements and/or measures	43
7	Information for use	
7.1	General	
7.2	Instruction handbook	
7.2.1	General	
7.2.2	Information related to installation	
7.2.3	Information related to operation	
7.2.4	Information related to maintenance	
7.3	Marking	49

Annex	A (normative) Basis for air flow calculation of chamber dryers and continuous flow dryers	50
<b>A.1</b>	Calculation basis for chamber dryers	50
A.1.1	General	
A.1.2	Calculation of chamber dryers in case of rapid evaporation - Method A	50
A.1.3	Determination in case of slow evaporation – Method B	54
<b>A.2</b>	Calculation basis for continuous flow dryers	55
Annex	B (informative) Examples of calculation	57
<b>B.1</b>	Chamber dryers	57
B.1.1	Example 1: Calculation of the required minimum exhaust flow (see 3.20)	57
B.1.2	Example 2: Calculation of the maximum admissible amount of varnish	58
<b>B.2</b>	Continuous flow dryers	60
<b>B.2.1</b>	Example 3: Calculation of the minimum exhaust flow rate	60
<b>B.2.2</b>	Example 4: Calculation of the minimum exhaust flow rate	62
B.2.3	Example 5: Calculation of the maximum admissible throughput of flammable substances	63
Annex	C (normative) Concentration measurement in dryers	65
<b>C.1</b>	Measurement of flammable substances	
C.1.1	General	65
C.1.2	Requirements for concentration monitoring systems	65
<b>C.2</b>	Monitoring of oxygen concentration	66
C.2.1	General	66
C.2.2	Requirements for oxygen monitoring systems	66
Annex	D (normative) Calculation of the lower explosion limit at drying temperature	68
<b>D.1</b>	General	68
D.2	Influence of temperature on the indicated value of concentration (physical influence)	68
D.3	Influence of the temperature of mixture on the kinetics of reaction (chemical influence)	69
<b>D.4</b>	Consideration of chemical and physical influences	69
Annex	E (normative) Explosion reliefs	70
Annex	F (informative) Sensors for measurement of the volume flow flow	71
F.1	Pitot-static tubes	71
F.2	Venturi nozzles	71
F.3	Wind vanes and plate anemometers	71
F.4	Hot-wire anemometers	71
F.5	Ultrasonic anemometers	71
F.6	Windmill anemometer	72

#### EN 1539:2015 (E)

Annex	G (normative) Requirements for energy-efficiency and reduction of environmental impact	73
<b>G.1</b>	General	73
<b>G.2</b>	Acquisition	73
<b>G.3</b>	Production	73
<b>G.4</b>	Use	73
G.4.1	General	73
G.4.2	Energy usage	73
G.4.3	Minimizing of emissions to air	74
G.4.4	Minimizing of noise emissions	74
<b>G.5</b>	End of Life	74
Annex	H (informative) Guide for implementation of control system requirements for explosion protection for type A dryers	75
H.1	General	75
Н.2	Example for chamber dryer	76
Н.3	Example for continuous flow dryer	77
Annex	ZA (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC	80
Bibliog	graphy	81

EN 1539:2015 (E)

#### **European foreword**

This document (EN 1539:2015) has been prepared by Technical Committee CEN/TC 271 "Surface treatment equipment - Safety", 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 April 2016, and conflicting national standards shall be withdrawn at the latest by April 2016.

This document supersedes EN 1539:2009.

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 the EU Directive 2006/42/EC.

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

This European Standard is part of a series of standards in the area of safety for development and construction of machines and plants for the coating of surfaces with organic substances (paints, lacquers and similar products).

This European Standard was prepared with contribution of the following TCs:

- TC 186 "Industrial thermoprocessing Safety";
- TC 198 "Printing and paper machinery Safety";
- TC 200 "Tannery machinery Safety";
- TC 202 "Foundry machinery".

NOTE 1 Although a dryer as a whole is not subject to the ATEX Directive 94/9/EC in a formal way, this document is based on a fundamental risk assessment according to this Directive.

NOTE 2 This European Standard is based on an explosion protection concept which does not define zones for areas with potentially explosive atmosphere.

In relation to the previous version of the standard, the following main modifications have been made

- the scope has been adjusted to meet the fields of application of the standard;
- the requirements for safety related controls have been modified for clarification;
- guidance for implementation of safety related control systems has been included;
- requirements for monitoring of heating system have been implemented;
- requirements for type B dryers have been detailed;
- requirements for minimization of energy usage and environmental impact have been included.

#### EN 1539:2015 (E)

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 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.

#### Introduction

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

This document is of relevance in particular for the following stakeholder group representing the market players with regard to machinery safety:

- machinery manufacturers (small, medium and large enterprises);
- health and safety bodies (regulators, accident prevention organisations, market surveillance).

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

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.

#### 1 Scope

This European Standard deals with all significant hazards, hazardous situations and hazardous events relevant to ovens and dryers in which flammable substances are released by evaporation from and curing of coating materials.

The specific significant risks related to the use of this machinery with foodstuff and pharmaceutical products are not dealt with in this European Standard.

This European Standard is only applicable to machines which are used as intended and under the conditions which are foreseeable as malfunction by the manufacturer (see Clause 4).

For ovens and dryers in which flammable substances are released by evaporation from and curing of coating materials, in which the concentration of these flammable substances shall not, under no circumstances, exceed 3 % of the LEL, EN 746-1 and EN 746-2 may be applied instead of this European Standard.

This European Standard is not applicable to:

- ovens for hardening metals;
- enamelling plants;
- portable heating systems for drying (for instance infrared radiant heaters, hot-air blowers, blow-dryers);
- solvent recovery plants;
- distillation and/or refraction plants;
- textile dry-cleaning systems.

This European Standard is not applicable to machinery manufactured before the date of its publication as EN.

#### 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 547-1, Safety of machinery — Human body measurements — Part 1: Principles for determining the dimensions required for openings for whole body access into machinery

EN 619, Continuous handling equipment and systems — Safety and EMC requirements for equipment for mechanical handling of unit loads

EN 746-1, Industrial thermoprocessing equipment — Part 1: Common safety requirements for industrial thermoprocessing equipment

EN 746-2, Industrial thermoprocessing equipment - Part 2: Safety requirements for combustion and fuel handling systems

EN 953, Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards

EN 1127-1, Explosive atmospheres - Explosion prevention and protection - Part 1: Basic concepts and methodology

EN 12198-1:2000+A1:2008, Safety of machinery - Assessment and reduction of risks arising from radiation emitted by machinery - Part 1: General principles

EN 12198-2, Safety of machinery — Assessment and reduction of risks arising from radiation emitted by machinery — Part 2: Radiation emission measurement procedure

EN 12433-1, Industrial, commercial and garage doors and gates - Terminology - Part 1: Types of doors

EN 12433-2, Industrial, commercial and garage doors and gates - Terminology - Part 2: Parts of doors

EN 12445, Industrial, commercial and garage doors and gates - Safety in use of power operated doors - Test methods

EN 12453, Industrial, commercial and garage doors and gates - Safety in use of power operated doors - Requirements

EN 12635, Industrial, commercial and garage doors and gates — Installation and use

EN 12978, Industrial, commercial and garage doors and gates — Safety devices for power operated doors and gates — Requirements and test methods

EN 13023, Noise measurement methods for printing, paper converting, paper making machines and auxiliary equipment — Accuracy grades 2 and 3

EN 13463-1, Non-electrical equipment for use in potentially explosive atmospheres - Part 1: Basic method and requirements

EN 14462, Surface treatment equipment - Noise test code for surface treatment equipment including its ancillary handling equipment - Accuracy grades 2 and 3

EN 14994, Gas explosion venting protective systems

EN 15061, Safety of machinery — safety requirements for strip processing line machinery and equipment

EN 50104, Electrical apparatus for the detection and measurement of oxygen - Performance requirements and test methods

EN 60079-0, Explosive atmospheres - Part 0: Equipment - General requirements (IEC 60079-0)

EN 60079-29-1, Explosive atmospheres - Part 29-1: Gas detectors - Performance requirements of detectors for flammable gases (IEC 60079-29-1)

EN 60079-29-4, Explosive atmospheres - Part 29-4: Gas detectors - Performance requirements of open path detectors for flammable gases (IEC 60079-29-4)

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

EN 61000-6-2, Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments (IEC 61000-6-2)