

**Pindamisseadmed. Sukel- ja elektrofoor-
pindamismasinad orgaaniliste vedelike
pindamismaterjalide kasutamiseks. Ohutusnõuded
KONSOLIDEERITUD TEKST**

Coating plants - Machinery for dip coating and
electrodeposition of organic liquid coating material - Safety
requirements CONSOLIDATED TEXT

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 12581:2006+A1:2010 sisaldab Euroopa standardi EN 12581:2005+A1:2010 ingliskeelset teksti.

Standard on kinnitatud Eesti Standardikeskuse 30.09.2010 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.

Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 09.06.2010.

Standard on kättesaadav Eesti standardiorganisatsioonist.

This Estonian standard EVS-EN 12581:2006+A1:2010 consists of the English text of the European standard EN 12581:2005+A1:2010.

This standard is ratified with the order of Estonian Centre for Standardisation dated 30.09.2010 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.

Date of Availability of the European standard text 09.06.2010.

The standard is available from Estonian standardisation organisation.

ICS 87.100

Standardite reprodutseerimis- ja levitamiseõigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonilisse süsteemi või edastamine ükskõik millises vormis või millisel teel on keelatud ilma Eesti Standardikeskuse poolt antud kirjaliku loata.

Kui Teil on küsimusi standardite autorikaitse kohta, palun võtke ühendust Eesti Standardikeskusega:
Aru 10 Tallinn 10317 Eesti; www.evs.ee; Telefon: 605 5050; E-post: info@evs.ee

Right to reproduce and distribute belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without permission in writing from Estonian Centre for Standardisation.

If you have any questions about standards copyright, please contact Estonian Centre for Standardisation:
Aru str 10 Tallinn 10317 Estonia; www.evs.ee; Phone: 605 5050; E-mail: info@evs.ee

English Version

Coating plants - Machinery for dip coating and electrodeposition of organic liquid coating material - Safety requirements

Installations d'application - Installations au trempé et par
électrodéposition de produits de revêtements organiques
liquides - Prescriptions de sécurité

Beschichtungsanlagen - Tauchbeschichtungsanlagen und
Elektrotauchbeschichtungsanlagen für organische flüssige
Beschichtungsstoffe - Sicherheitsanforderungen

This European Standard was approved by CEN on 28 October 2005 and includes Amendment 1 approved by CEN on 6 May 2010.

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, Croatia, 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: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword.....	5
Introduction	6
1 Scope	7
2 Normative references	7
3 Terms and definitions	10
4 List of significant hazards	16
4.1 General.....	16
4.2 Mechanical hazards	16
4.2.1 Shearing, crushing, cutting, entanglement, drawing-in and impact hazards	17
4.2.2 Loss of stability (of the dip or electrophoretic coating machinery)	17
4.2.3 Entrapment hazard	17
4.2.4 Personnel's slip, trip and fall of personnel	17
4.3 Electrical hazards	17
4.3.1 Electrical shock.....	17
4.3.2 External influence on electrical equipment hazards	18
4.4 Thermal hazards	18
4.5 Hazards generated by noise	18
4.6 Hazards resulting from dangerous substances	18
4.7 Fire and explosion hazards	18
4.7.1 Fire hazard	18
4.7.2 Explosion hazard	19
4.8 Hazards caused by failure of energy supply	19
4.9 Hazards related to failure of control systems.....	20
5 Safety requirements and/or measures	20
5.1 General.....	20
5.2 Mechanical safety requirements	20
5.2.1 Safeguarding of danger points.....	20
5.2.2 Safety measures against loss of stability (of dip or electrophoretic coating machinery and their parts)	23
5.2.3 Protective measures against entrapment	23
5.2.4 Measures against personnel's slip, trip and fall.....	24
5.3 Electrical safety requirements.....	24
5.3.1 General.....	24
5.3.2 Measures against electrical shock.....	24
5.3.3 Measures against external influence on electrical equipment	25
5.4 Safety requirements and measures against thermal hazards	25
5.4.1 Heating systems	25
5.4.2 Measures against contact of the skin with hot surfaces	26
5.4.3 Measures against radiation and/or convection of heat	26
5.4.4 Measures against overheating of organic liquid coating material	26
5.5 Safety requirements and measures against noise.....	26
5.6 Safety requirements against dangerous substances	28
5.6.1 Measures against contact with/or absorption of dangerous fluids (organic liquid coating material, solvents)	28
5.6.2 Measures against inhalation of dangerous volatile substances	29
5.6.3 Measures against inhalation of toxic gases released by the heating device	32
5.6.4 Measures against contact with hazardous foams or inhalation of hazardous gases, vapours emitted by fire extinguishing equipment	32
5.7 Safety requirements and measures against fire and explosion	32

5.7.1	Fire	32
5.7.2	Explosions	33
5.8	Safety requirements and measures against failure of energy supply	35
5.9	Safety requirements and measures against failure of control systems	36
5.9.1	General	36
5.9.2	Level of safety	37
5.9.3	Emergency stop equipment	37
5.9.4	Failure or malfunction of the control system	37
6	Verification of the safety requirements and/or measures	38
6.1	General	38
6.2	Mechanical	38
6.3	Electrical	38
6.4	Thermal	38
6.5	Noise	38
6.6	Dangerous substances	38
6.6.1	Tank and ancillary equipment	38
6.6.2	Measures against contact with/or absorption/or inhalation of hazardous fluids or vapours	38
6.7	Verification of the safety requirements and measures against fire and explosion	39
6.7.1	Fire	39
6.7.2	Explosion	39
6.7.3	Limitation of concentration	39
6.7.4	Hazardous areas and ignition sources	40
6.8	Failure of energy supply	40
6.9	Control systems	40
7	Information for use	40
7.1	General	40
7.2	Instruction handbook	40
7.3	Marking	44
Annex A	(normative) Diagrams related to hazardous zones of potentially explosive atmosphere	45
Annex B	(normative) Determination of concentration of flammable solvents in terms of LEL	47
B.1	Dip coating machinery using solvent borne coating material	47
B.1.1	General	47
B.1.2	Calculation	47
B.1.3	Example: Calculation of the required minimum exhaust volume flow	48
B.2	Electrophoretic and dip coating machinery using water borne coating material	49
B.2.1	General	49
B.2.2	Data	49
B.2.3	calculation	49
Annex C	(informative) Diagrams relative to dip and electrophoretic coating machinery classification	52
Annex D	(informative) Classification of material's reaction to the fire - National standards	55
Annex E	(informative) Reference to national exposure limit values	56
Annex ZA	(informative) ZA Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC ZA	58
Annex ZB	(informative) Relationship between this European Standard and the Essential Requirements of EU Directive 94/9/EC	59
Bibliography	60

Figures

Figure A.1	— Dip coating machinery using solvent-borne coating material, with enclosure	45
Figure A.2	— Dip coating machinery using solvent-borne coating material with or without enclosure	46

Figure C.1 — Dip coating machinery without specific enclosure - with or without operator (see 5.6.2.2) 52

Figure C.2 — Dip coating machinery with specific enclosure – with or without operator (see 5.6.2.3)..... 53

Figure C.3 — Electrophoretic coating machinery without specific enclosure - with or without operator (see 5.6.2.4)..... 53

Figure C.4 — Electrophoretic coating machinery enclosed into a treatment tunnel - without operator (see 5.6.2.5)..... 54

Foreword

This document (EN 12581:2005+A1:2010) 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 December 2010, and conflicting national standards shall be withdrawn at the latest by December 2010.

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 includes Amendment 1, approved by CEN on 2010-05-06.

This document supersedes EN 12581:2005.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** and **A1**.

This European Standard 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(s).

For relationship with EU Directive(s), see informative Annexes ZA and ZB, which are integral parts of this document.

This European Standard is one of a set of standards devoted to the health and safety requirements of coating plants for the application and drying of organic liquid coating material and varnishes.

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, Croatia, 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.

Introduction

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

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

1.1 This European Standard applies to the design and construction of machinery for dip coating and electrodeposition of organic liquid coating material to industrial items.

This machinery consists of the following equipment:

- Transport system including hoists;
- Dip tank and safety tank;
- forced ventilation system;
- ancillary equipment such as pumps, filters, heaters.

This European Standard deals with the significant hazards, hazardous situations and events relevant to dip and electrophoretic coating machinery when they are used as intended and under the conditions foreseen by the manufacturer (see Clause 4).

In addition, the equipment marking and minimum use requirements are specified.

1.2 This European Standard does not cover:

- automatic loading and unloading systems;
- lifting accessories;
- dip and electrophoretic coating tanks without any technical devices such as enclosure, lip extractions, pumps, heaters;
- machinery for organic liquid coating material preparation, supply and draining systems (e.g. pumps);
- water and waste liquids treatment machinery;
- dip and electrodeposition coating machinery for web or coil coating;
- dip and electrophoretic coating machinery with tank volume less than 1 m³;

This European Standard is not applicable to industrial machinery for dip or electrophoretic coating processes which are manufactured before the date of publication of this European Standard by CEN.

2 Normative references

The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 294, *Safety of machinery — Safety distance to prevent danger zones being reached by the upper limbs*

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

EN 418, *Safety of machinery — Emergency stop equipment, functional aspects — Principles for design*

EN 525, *Non-domestic direct gas-fired forced convection air heaters for space heating not exceeding a net heat input of 300 kW*

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 547-3, *Safety of machinery — Human body measurements — Part 3: Anthropometric data*

EN 563, *Safety of machinery — Temperature of touchable surfaces — Ergonomics data to establish temperature limit values for hot surfaces*

EN 574, *Safety of machinery — Two-hand control devices — Functional aspects - Principles for design*

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

EN 809, *Pumps and pump units for liquids — Common safety requirements*

EN 811, *Safety of machinery — Safety distances to prevent danger zones being reached by the lower limbs*

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

EN 954-1:1996, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

CR 954-100, *Safety of machinery — Safety-related parts of control systems — Part 100: Guide on the use and application of EN 954-1:1996*

EN 971-1, *Paints and varnishes — Terms and definitions for coating materials — Part 1: General terms*

EN 981, *Safety of machinery — System of auditory and visual danger and information signals*

EN 982, *Safety of machinery — Safety requirements for fluid power systems and their components — Hydraulics*

EN 983, *Safety of machinery — Safety requirements for fluid power systems and their components — Pneumatics*

EN 999, *Safety of machinery — The positioning of protective equipment in respect of approach speeds of parts of the human body*

EN 1037, *Safety of machinery — Prevention of unexpected start-up*

EN 1088, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection*

EN 1127-1:2007 ^{A1}, *Explosive atmospheres — Explosion prevention and protection — Part 1: Basic concepts and methodology*

EN 1760-1, *Safety of machinery — Pressure sensitive protective devices — Part 1: General principles for the design and testing of pressure sensitive mats and pressure sensitive floors*

EN 1760-2, *Safety of machinery — Pressure sensitive protective devices — Part 2: General principles for the design and testing of pressure sensitive edges and pressure sensitive bars*

EN 1837, *Safety of machinery — Integral lighting of machines*

EN 1838, *Lighting applications — Emergency lighting*

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*

prEN 12621, *Machinery for the supply and circulation of coating materials under pressure — Safety requirements*

prEN 12650-1, *Automatic door systems — Part 1: Product requirements and test methods*

prEN 12650-2, *Automatic door systems — Part 2: Safety at automatic pedestrian doors*

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

EN 13463-1:2001, *Non-electrical equipment for potentially explosive atmospheres — Part 1: Basic method and requirements*

Ⓐ EN 13463-5:2003 Ⓐ, *Non-electrical equipment intended for use in potentially explosive atmospheres — Part 5: Protection by constructional safety “c”*

EN 13478, *Safety of machinery — Fire prevention and protection*

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

Ⓐ EN 14986, *Design of fans working in potentially explosive atmospheres* Ⓐ

EN 50073, *Guide for the selection, installation, use and maintenance of apparatus for the detection and measurement of combustible gases or oxygen*

Ⓐ EN 60079-0:2009, *Explosive atmospheres — Part 0: Equipment — General requirements (IEC 60079-0:2007)* Ⓐ

Ⓐ EN 60079-15:2005, *Electrical apparatus for explosive gas atmospheres — Part 15: Construction, test and marking of type of protection “n” electrical apparatus (IEC 60079-15:2005)* Ⓐ

Ⓐ EN 60079-17:2007, *Explosive atmospheres — Part 17: Electrical installations inspection and maintenance (IEC 60079-17:2007)* Ⓐ

Ⓐ EN 60079-29-1:2007, *Explosive atmospheres — Part 29-1: Gas detectors — Performance requirements of detectors for flammable gases (IEC 60079-29-1:2007, modified)* Ⓐ

EN 60204-1:1997, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:1997)*

EN 60529, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)*

EN 61000-6-1, *Electromagnetic compatibility (EMC) — Part 6-1: Generic standards — Immunity for residential, commercial and light-industrial environments (IEC 61000-6-1:1997, modified)*

EN 61000-6-3, *Electromagnetic compatibility (EMC) — Part 6-3: Generic standards — Emission standard for residential, commercial and light-industrial environments (IEC 61000-6-3:1996, modified)*

EN 61000-6-4, *Electromagnetic compatibility (EMC) — Part 6-4: Generic standards — Emission standard for industrial environments (IEC 61000-6-4:1997, modified)*

EN 61496-1, *Safety of machinery — Electro-sensitive protective equipment — Part 1: General requirements and tests (IEC 61496-1:2004, modified)*

A1 deleted text **A1**

EN ISO 11688-1, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning (ISO/TR 11688-1:1995)*

EN ISO 12100-1:2003, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology (ISO 12100-1:2003)*

EN ISO 12100-2:2003, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles (ISO 12100-2:2003)*

EN ISO 14122-1, *Safety of machinery — Permanent means of access to machinery — Part 1: Choice of fixed means of access between two levels (ISO 14122-1:2001)*

EN ISO 14122-2, *Safety of machinery — Permanent means of access to machinery — Part 2: Working platforms and walkways (ISO 14122-2:2001)*

EN ISO 14122-3, *Safety of machinery — Permanent means of access to machinery — Part 3: Stairs, stepladders and guard-rails (ISO 14122-3:2001)*

EN ISO 14122-4, *Safety of machinery — Permanent means of access to machinery — Part 4: Fixed ladders (ISO 14122-4:2004)*

3 Terms and definitions

For the purposes of this European standard, the terms and definitions given in EN 971-1 and EN ISO 12100-1:2003 apply.

Additional terms and definitions specifically needed for this European Standard are added below.

3.1
dip coating machinery
dip coating machinery are the machines constituting a dip coating installation. Dip coating installations are used to apply organic liquid coating material to industrial items. Dip coating installation may consist of the following machinery and parts:

- transport equipment,
- transport system consisting of the following parts (dip, drip, dry),
- dip tank and safety tank,
- forced ventilation system,
- equipment for draining area with method of containing,
- equipment for flash-off area,
- ancillary equipment such as pumps, filters, heaters, stirring device ...;

NOTE Dip coating machinery can be placed: