
DfYa UnbYbUdfUj YÈBUdfUj YnUbuUyUbuYhY_c]\`cf[Ubg_]`dfYa Uncj`g
dchUd`UbuYa`cn]fca Ug'dchUd`UbuYa`]bi dcfUvc`YY_h] bY[Utc_UÈJUfbcgfbY
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Coating plants - Machinery for dip coating and electrodeposition of organic liquid coating material - Safety requirements

Beschichtungsanlagen - Tauchbeschichtungsanlagen und
Elektrotauchbeschichtungsanlagen für organische flüssige Beschichtungsstoffe -
Sicherheitsanforderungen (standards.iteh.ai)

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

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ICS 87.100

English Version

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Beschichtungsstoffe - Sicherheitsanforderungen

This European Standard was approved by CEN on 28 October 2005.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

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

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

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Foreword

This European Standard (EN 12581:2005) 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of an identical text or by endorsement, at the latest by June 2006, and conflicting national standards shall be withdrawn at the latest by June 2006.

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 an integral part of this European Standard.

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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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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.

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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*

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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 1127-1:1997, *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, *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 50073, *Guide for the selection, installation, use and maintenance of apparatus for the detection and measurement of combustible gases or oxygen*

EN 60079-0, *Electrical apparatus for explosive gas atmospheres — Part 0: General requirements (IEC 60079-0:2004)*

EN 60079-15, *Electrical apparatus for explosive gas atmospheres — Part 15: Type of protection “n” (IEC 60079-15:2001, modified)*

EN 60079-17, *Electrical apparatus for explosive gas atmospheres - Part 17: Inspection and maintenance of electrical installations in hazardous areas (other than mines) (IEC 60079-17:2002)*

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)*

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EN 61779-1, *Electrical apparatus for the detection and measurement of flammable gases — Part 1: General requirements and test methods (IEC 61779-1:1998, modified)*

EN 61779-4, *Electrical apparatus for the detection and measurement of flammable gases — Part 4: Performance requirements for group II apparatus indicating a volume fraction up to 100 % lower explosive limit (IEC 61779-4:1998, modified)*

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)*

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3 Terms and definitions

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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:

- inside a workshop (no specific enclosure) - see Figure C.1;
- in a treatment tunnel (enclosure) - see 3.6 and Figure C.2.

3.2

electrophoretic coating machinery

machinery for electrodeposition of organic liquid coating material to industrial items. Electrophoretic coating installation may consist of the following machinery and parts:

- transport equipment,
- transport system consisting of the following parts (dip, drip, dry),
- electrophoretic 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 1 Electrophoretic coating machinery can be placed:

- inside a workshop (no specific enclosure) - see Figure C.3;
- in a treatment tunnel (enclosure) - see 3.6 and Figure C.4.

NOTE 2 Electrodeposition of paint is a process in which electrically charged paint particles are plated out of water suspension to coat a conductive object.

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3.3

transport system

a transport system may consist of the following machinery or components:

- transport supporting frame (e. g. rails)
- conveying drives
- hoists;
- lifting accessories (e. g. spreader, belt, chain, rope, hook etc.)
- carriers (e. g. frame, drum, basket, metal cage)

3.4

automatic dip or electrophoretic coating machinery

arrangements of baths with program-controlled loading equipment

3.5

transport

the movement of the items through the coating installation

3.6

treatment tunnel

enclosure, closed on all sides except for the openings to allow ingress and egress of work items and access doors

3.7

storage tank

vessel for containing the coating material (dip process) which is used to supply the coating tank or to empty the coating tank, e. g. for maintenance

3.8

safety tank

enclosed tank able to receive, in case of emergency, the total volume of coating material contained in the coating tank and able to be isolated automatically

3.9

draining area

enclosure or area of the transport system where drops of coating material or rinsing liquids from the coated work items are collected

3.10

flash-off area

forced ventilated enclosure of the transport system where solvent evaporation takes place

3.11

rinsing area

enclosure or tunnel of the transport system where the electrophoretic coated work items are washed and/or rinsed to eliminate non-adherent coating

3.12

organic liquid coating material

product or mixture, in liquid form containing organic resins and/or polymers, that when applied to a substrate (see 3.29) forms a film possessing protective, decorative and/or specific technical properties (for example industrial paints, varnishes, etc.)

3.12.1

solvent-borne coating material

coating material in which the binder (see 3.13) is dispersed or dissolved in a continuous phase consisting mainly of organic solvent (see 3.14)

3.12.2

water-borne coating material

coating material in which the binder is dispersed or dissolved in a continuous phase consisting mainly of water

3.13

binder

the non-volatile part of the medium which forms the film (see 1.6 of EN 971-1)

3.14

solvent

single liquid or blends of liquids, volatile under specified drying conditions, and in which the binder is completely soluble (see 1.45 of EN 971-1:)

NOTE Solvents are also contained in liquids used as cleaning or washing agents.

3.15

application process

action of putting organic liquid coating material on a substrate (see 3.29) so that it forms a surface film

3.16

dip coating process

application of coating material by immersing of work items in a dip tank containing the coating material

NOTE Two types of organic liquid coating material are used: water-borne coating material and solvent-borne coating material.

3.17

electrophoretic coating processes

application of water-borne coating material by immersion of work items in a dip tank containing the coating material which is deposited by application of direct current (DC)

NOTE There are two types of electrophoretic coating processes :

- cathophoretic coating where the work item is used as cathode;
- anaphoretic coating where the work item is used as anode.

3.18

flammable substance

substance in form of gas, vapour, liquid, solid or mixtures of these, able to undergo an exothermic reaction with air when ignited (see 3.1 of EN 1127-1:1997). "Combustible material" and "flammable substance" are equivalently used terms in this standard

3.19

recirculated air

air extracted from a volume and reintroduced into it. In this standard, the volume is equal to the machinery's dimension (L x W x H)

3.20

make-up air

air introduced into a volume to replace the air exhausted from it

3.21

forced ventilation

air circulation achieved by one or several fans. This air-circulation is located inside the machinery

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3.22

explosive atmosphere

mixture with air, under atmospheric conditions, of flammable substances in the form of gases, vapours, mists or dusts, in which, after ignition has occurred, combustion spreads to the entire unburned mixture (see 3.17 of EN 1127-1:1997)

3.23

explosion range

range of the concentration of a flammable substance in air, within which an explosion can occur (see 3.13 of EN 1127-1:1997)

3.24

lower explosion limit (LEL)

lower limit of the explosion range (see 3.8 and 3.13 of EN 1127-1:1997). Explosion limit" and "Ignition limit" are equivalent. In accordance with international usage, only the term "Explosion limit" is used in this standard

3.25

exposure limits

concentration limits of hazardous substances in air required by worker health legislation

NOTE Limits can be different according to the countries (see Annex E).