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**Naprave za površinsko čiščenje in predobdelavo industrijskih proizvodov s pomočjo tekočin ali par - 3. del: Varnost naprav, v katerih se za čiščenje uporabljajo vnetljive tekočine**

Machines for surface cleaning and pre-treatment of industrial items using liquids or vapours - Part 3: Safety of machines using flammable cleaning liquids

Maschinen zur Oberflächenreinigung und -vorbehandlung von industriellen Produkten mittels Flüssigkeiten oder Dampfphasen - Teil 3: Sicherheit von Anlagen, in denen brennbare Reinigungsflüssigkeiten verwendet werden

Machines de nettoyage et de prétraitement de pièces industrielles utilisant des liquides ou des vapeurs - Partie 3: Sécurité des machines utilisant des liquides de nettoyage inflammables

**Ta slovenski standard je istoveten z: EN 12921-3:2005**

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**ICS:**

97.080      Aparati za nego tal      Floor treatment appliances

**SIST EN 12921-3:2005**      **en**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 12921-3**

May 2005

ICS 25.220.10; 25.220.20

English version

## Machines for surface cleaning and pre-treatment of industrial items using liquids or vapours - Part 3: Safety of machines using flammable cleaning liquids

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This European Standard was approved by CEN on 21 March 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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## Contents

	Page
Foreword.....	3
0 Introduction.....	4
1 Scope.....	5
2 Normative references.....	5
3 Terms and definitions.....	6
4 List of significant hazards.....	10
5 Safety requirements and/or measures.....	11
5.1 General.....	11
5.2 Mechanical hazards.....	11
5.3 Safety requirements and measures against electrical hazards.....	13
5.4 Safety requirements and measures against thermal hazards.....	13
5.5 Safety requirements and measures against noise.....	13
5.6 Safety requirements and measures against hazards generated by materials and substances processed, used or emitted by the cleaning machine.....	14
5.7 Safety requirements and measures against hazard combinations.....	22
5.8 Safety requirements and measures against failure of energy supply.....	22
5.9 Safety measures against hazards related to failure of control systems.....	23
6 Verification of the safety requirements.....	23
6.1 General.....	23
6.2 Mechanical.....	23
6.3 Electrical.....	23
6.4 Thermal.....	23
6.5 Noise.....	23
6.6 Material and substances processed, used or emitted by the cleaning machines.....	24
6.7 Hazard combinations.....	26
6.8 Failure of energy supply.....	26
6.9 Control systems.....	26
7 Information for use.....	27
7.1 General.....	27
7.2 Instruction handbook.....	27
7.3 Marking.....	27
Annex A (normative) Determination of inherently limited heating of cleaning machines.....	29
Annex B (informative) Classification of flammable liquids according to Directive 67/548/EEC.....	30
Annex C (informative) Area classification examples for cleaning machines using flammable cleaning liquids.....	31
Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 98/37/EC.....	35
Bibliography.....	36

## Foreword

This European Standard (EN 12921-3:2005) 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 November 2005, and conflicting national standards shall be withdrawn at the latest by November 2005.

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(s).

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

This document is part of a series of standards in the area of safety for development and construction of machines for surface cleaning and pre-treatment of industrial items using liquids or vapours.

The EN 12921 series includes the following parts:

- Part 1: Common safety requirements;
- Part 2: Safety of machines using water based cleaning liquids;
- Part 3: Safety of machines using flammable cleaning liquids;
- Part 4: Safety of machines using halogenated solvents.

NOTE Although a machine for surface cleaning and pre-treatment of industrial items, as an integral whole, formally does not fall under the scope of the ATEX Directive 94/9/EC, the standard is based upon a fundamental risk analysis according to this directive.

This European Standard includes a Bibliography.

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.

**EN 12921-3:2005 (E)****0 Introduction**

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

This European Standard contains additional safety requirements to and/or deviations from EN 12921-1.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered is 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.

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## 1 Scope

This European Standard deals with the significant hazards of machines for surface cleaning and pre-treatment - in the following called "cleaning machines" - of industrial items using flammable cleaning liquids or a mixture of cleaning liquids, even in emulsion form, which can potentially create, even temporarily, a condition of flammability.

This European Standard applies in combination with EN 12921-1. Both parts together cover all significant hazards relevant for cleaning machines of industrial items using liquids or vapours, when they are used as intended and under the conditions foreseen by the manufacturer (see Clause 4). The specific requirements specified in this European Standard take precedence over the respective requirements of EN 12921-1.

To the extent of this document the terms combustible materials and flammable substance and explosive are equivalently used.

NOTE 1 The condition of flammability can be generated only when molecules of the fluid are in intimate contact with oxygen from the air. Ignition is possible when: the fluid generates a concentration of vapour in air, or: the flammable fluid is present as a suspension of fine droplets in air (aerosol).

NOTE 2 In practice, fires and explosions differ by the size and intensity of the reaction, and by the instantaneous effects on the environment.

This European Standard does not apply to machinery and related equipment excluded from the scope of EN 12921-1.

This European Standard is not applicable to cleaning machines of industrial items using flammable cleaning liquids which are manufactured before the publication of this European Standard by CEN.

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## 2 Normative references

SIST EN 12921-3:2005

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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.

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

EN 1127-1:1997, *Explosive atmospheres - Explosion prevention and protection – Part 1: Basic concepts and methodology*

EN 1539, *Dryers and ovens, in which flammable substances are released – Safety requirements*

EN 12921-1:2005, *Machines for surface cleaning and pre-treatment of industrial items using liquids or vapours – Part 1: Common safety requirements*

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 50015:1998, *Electrical apparatus for potentially explosive atmospheres — Oil immersion "o"*

EN 50017, *Electrical apparatus for potentially explosive atmospheres — Powder filling "q"*

EN 50020, *Electrical apparatus for potentially explosive atmospheres — Intrinsic safety "i"*

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

**EN 12921-3:2005 (E)**

EN 60079-1, *Electrical apparatus for potentially explosive gas atmospheres — Part 1: Flameproof enclosures "d"* (IEC 60079-1:2003)

EN 60079-2, *Electrical apparatus for explosive gas atmospheres – Part 2: Pressurized enclosures "p"* (IEC 60079-2:2001)

EN 60079-7, *Electrical apparatus for explosive gas atmospheres — Part 7: Increased safety "e"* (IEC 60079-7:2001)

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

EN 60079-18, *Electrical apparatus for explosive gas atmospheres — Part 18: Construction test and marking of type of protection encapsulation "m" electrical apparatus* (IEC 60079-18:2004)

EN 60079-25, *Electrical apparatus for explosive gas atmospheres — Part 25: Intrinsically safe systems* (IEC 60079-25:2003)

EN 60204-1, *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 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, *Safety of machinery – Basic concepts, general principles for design – Part 2: Technical principles* (ISO 12100-2:2003)

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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 ISO 12100-1:2003, EN 12921-1:2005 and the following apply.

**3.1****area classification**

assessed division of a facility into hazardous areas and non-hazardous areas, and the subdivision of the hazardous areas into zones

**3.2****explosive atmosphere**

mixture with air, under atmospheric condition, of flammable substance(s) in the form of gas, vapour, mist or dust, in which, after ignition has occurred, combustion spreads to the entire unburned mixture (see 3.17 of EN 1127-1:1997)

**3.3****explosion range**

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

**3.4****flammable substance**

substance in the 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)



### 3.5

#### **flammable cleaning liquid**

liquid which can release vapours, under certain circumstances, able to undergo an exothermic reaction with air when ignited

NOTE A fluid (gas or liquid) can only burn when the molecules of the liquid are in intimate contact with oxygen from the air. Ignition is possible when the liquid generates a concentration of vapour in air or the flammable liquid is present as a suspension of fine droplets in air (aerosol).

### 3.6

#### **flash point**

minimum temperature at which, under specified test conditions, a liquid gives off sufficient combustible gas or vapour to ignite momentarily on application of an effective ignition source (see 3.18 of EN 1127-1:1997)

NOTE The classification of flammable liquids according to their flash point as per EU Directive 67/548/EEC is provided in Annex B.

### 3.7

#### **hazardous areas**

areas where hazards due to explosive atmosphere may exist. The probability of occurrence of explosive atmosphere is classified in different zones. Limits of hazardous zones are given in Annex C

#### 3.7.1

##### **zone 0**

place in which an explosive atmosphere (consisting of a mixture with air of flammable substances in the form of gas, vapour or mist) is present continuously or for long periods or frequently (see 6.3.2 of EN 1127-1:1997)

#### 3.7.2

##### **zone 1**

place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapour or mist is likely to occur in normal operation occasionally (see 6.3.2 of EN 1127-1:1997)

#### 3.7.3

##### **zone 2**

place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapour or mist is not likely to occur in normal operation but, if it does occur, will persist for a short period only (see 6.3.2 of EN 1127-1:1997)

### 3.8

#### **equipment category**

#### 3.8.1

##### **equipment group II category 1**

equipment in this category is intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours or mists are present continuously for long periods or frequently (see 3.2.3 of EN 13463-1:2001)

NOTE Equipment of category 1 is suitable for use in zone 0.

#### 3.8.2

##### **equipment group II category 2**

equipment in this category is intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours or mists are likely to occur (see 3.2.4 of EN 13463-1:2001)

NOTE Equipment of category 2 is suitable for use in zone 1.

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**EN 12921-3:2005 (E)****3.8.3****equipment group II category 3**

equipment in this category is intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours or mists are unlikely to occur, or, if they do occur, are likely to do so only in frequently and for a short period only (see 3.2.5 of EN 13463-1:2001)

NOTE Equipment of category 3 is suitable for use in zone 2.

**3.9****ignition source**

source of energy sufficient to cause ignition of an explosive atmosphere

**3.10****ignition temperature (of a combustible gas or of a combustible liquid)**

lowest temperature of the heated wall as determined under specified test conditions, at which the ignition of a combustible substance in the form of gas or vapour mixture with air will occur (see 3.31 of EN 1127-1:1997)

**3.11****inerting**

addition of inert substances to prevent explosive atmospheres (see 3.21 of EN 1127-1:1997)

**3.12****inherently limited heating (source)**

any heat source (including heating system) which is part of the cleaning machine not having enough power to heat the cleaning liquid above the limit temperature (see Annex A)

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SIST EN 12921-3:2005

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**3.13****limit temperature**

flash point temperature of a cleaning liquid minus a safety margin

NOTE For safety margins see 5.6.3.2.1.1.

**3.14****lower explosion limit (LEL)**

lower limit of the explosion range (see 3.8 of EN 1127-1:1997)

**3.15****types of cleaning machines**

following definitions of cleaning machines apply

**3.15.1****type A1**

cleaning machines in which no explosive atmosphere is present during normal operation according to their intended use and the flammable cleaning liquid cannot reach the limit temperature during normal operation and in which jetting of cleaning liquid does not generate aerosol leading to an explosive atmosphere.

These machines do not have any heat source which can provide sufficient energy to heat the flammable cleaning liquid up to the limit temperature

NOTE Aerosol generation is related to the shape of the nozzle, the product characteristics (density, viscosity etc.) and pressure. This aerosol generation is more unlikely at pressures < 70 kPa.

**3.15.2****Type A2**

cleaning machines in which no explosive atmosphere is present during normal operation according to their intended use and the flammable cleaning liquid cannot reach the limit temperature during normal operation and in which jetting of cleaning liquid does not generate aerosol leading to an explosive atmosphere.

These machines are equipped with heating or ultrasonic devices or pump around (circulating) system or any other heat source which can provide sufficient energy to heat the flammable cleaning liquid up to the limit temperature

NOTE Aerosol generation is related to the shape of the nozzle, the product characteristics (density, viscosity etc.) and pressure. This aerosol generation is more unlikely at pressures < 70 kPa but the fact has to be established in each case.

**3.15.3****type B**

cleaning machines using spraying with a nozzle pressure above 70 kPa and where the temperature of the flammable cleaning liquid is lower or equal to the limit temperature in any circumstance

**3.15.4****type C**

cleaning machines where the cleaning liquid can reach a temperature at which an explosive atmosphere is likely to occur during normal operations. These machines are equipped with a monitoring system

**3.16****spray rinsing process**

jetting cleaning liquid in air with a nozzle pressure  $\leq 70$  kPa

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**3.17****spraying**

jetting cleaning liquid in air with a nozzle pressure  $\geq 70$  kPa

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**3.18****upper explosion limit (UEL)**

temperature of a combustible cleaning liquid at which the concentration of the saturated vapour in air is equal to the upper explosion limit

**3.19****ambient temperature**

temperature which can be reached at any time by the atmosphere around the cleaning machine due to any heat source which can be normally expected

**3.20****mist eliminator**

device placed in a ventilation duct in order to reduce the concentration of droplets in suspension in air in such a way that the exhausted air is not explosive

## 4 List of significant hazards

Table 1 — List of significant hazards associated with machines for surface cleaning and pre-treatment using flammable cleaning liquids

Clause/sub-clause of this European Standard	Hazard	Clause/sub-clause of EN 12921-1:2005
4.1	<b>General</b> This clause contains significant hazards, hazardous situations and events, as far as they are dealt with in this document, identified by risk assessment as significant for this type of machinery using flammable cleaning liquids and which requires action to eliminate or reduce the risk. NOTE Information on the method of risk analysis is given in EN 1050.	4.1
4.2	<b>Mechanical hazards</b>	4.2
4.2.2	<b>Crushing, shearing, cutting, entanglement, drawing-in, impact</b>	4.2.1
4.2.3	<b>High pressure fluid ejection</b>	4.2.2
4.2.4	<b>Ejection of parts of the cleaning machine and/or items</b>	4.2.3
4.2.5	<b>Loss of stability (of cleaning machine and cleaning machine parts)</b>	4.2.4
4.2.6	<b>Personnel's slip, trip and fall hazards</b>	4.2.5
4.3	<b>Electrical hazards</b>	4.3
4.4	<b>Thermal hazards</b>	4.4
4.5	<b>Hazards generated by noise</b>	4.5
4.6	<b>Hazards generated by materials and substances processed, used or emitted by the cleaning machine</b>	4.6
4.6.1	<b>General</b>	4.6.1
4.6.2	<b>Hazards resulting from contact with/or inhalation of dangerous liquids, gases, aerosol, vapours, fumes and dusts</b>	4.6.2
4.6.3	<b>Fire and explosion hazard</b>	4.6.3
4.6.3.1	<b>Fire hazard</b>	4.6.3, 4.6.3.1
4.6.3.2	<b>Explosion hazard</b>	
4.6.3.2.2	<b>Generation of explosive atmosphere</b> Generation of an explosive atmosphere is related to flammable cleaning liquids under the following circumstances: — as a vapour, when the vapour concentration in air is within the explosive range between LEL and UEL; — as a suspension of fine droplets. Examples of flammable substances which increase the concentration above normal are: — high cleaning liquid temperature leading to formation of flammable vapours; — insufficient cleaning liquid coverage of heating elements; — leaks or drips of cleaning liquid on hot surfaces; — spraying of the cleaning liquid generating fine droplets and mist; — change in composition of the flammable cleaning liquid.	
4.6.3.2.3	<b>Ignition of an explosive atmosphere</b> Ignition of an explosive atmosphere is related to:	