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**Naprave za površinsko čiščenje in predobdelavo industrijskih proizvodov s pomočjo tekočin in par – 4. del: Varnost naprav, v katerih se za čiščenje uporabljajo halogenirana topila**

Machines for surface cleaning and pretreatment of industrial items using liquids or vapours - Part 4: Safety of machines using halogenated solvents

Maschinen zur Oberflächenreinigung und -vorbehandlung von industriellen Produkten mittels Flüssigkeiten oder Dampfphasen - Teil 4: Sicherheit von Maschinen, in denen halogenierte Lösemittel verwendet werden

Machines de nettoyage et de prétraitement de pièces industrielles utilisant des liquides ou des vapeurs - Partie 4: Sécurité des machines utilisant des solvants halogénés

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**EN 12921-4**

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**Machines for surface cleaning and pretreatment of industrial items using liquids or vapours - Part 4: Safety of machines using halogenated solvents**

Machines de nettoyage et de prétraitement de pièces industrielles utilisant des liquides ou des vapeurs - Partie 4: Sécurité des machines utilisant des solvants halogénés

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This European Standard was approved by CEN on 19 May 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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## EN 12921-4:2005 (E)

## Foreword

This European Standard (EN 12921-4:2005) has been prepared by the 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of an identical text or by endorsement, at the latest by December 2005, and conflicting national standards shall be withdrawn at the latest by December 2005.

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 safety requirements of the EC Directive(s).

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

This European Standard 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.

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.

## Introduction

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

This European Standard contains additional safety requirements to and/or deviations from EN 12921-1:2005.

The machinery concerned and the extent to which hazards, hazardous situations and 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 cleaning machines that have been designed and built according to the provisions of this type C standard.

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**EN 12921-4:2005 (E)****1 Scope**

This European Standard specifies the significant hazards of machines for surface cleaning and pre-treatment – in the following called "cleaning machines" – of industrial items using halogenated solvents, either pure or as a mixture.

This European Standard applies together with EN 12921-1:2005. 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 Part 4 take precedence over the respective requirements in EN 12921-1:2005.

This European Standard applies together with EN 12921-3 in case of release of flammable vapours from the cleaning liquids.

This European Standard does not apply to machinery and related equipment excluded from the scope of EN 12921-1:2005.

This European Standard is not applicable to cleaning machines which are manufactured before the 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 1093-3, *Safety of machinery — Evaluation of the emission of airborne hazardous substances — Part 3: Emission rate of a specified pollutant — Bench test method using the real pollutant*

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

EN 12921-3, *Machines for surface cleaning and pretreatment of industrial items using liquids or vapours — Part 3: Safety of machines using flammable cleaning liquids*

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 principle (ISO 12100-2:2003)*

**3 Terms and definitions**

For the purpose 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****halogenated solvent**

organic solvent containing at least one halogen atom per molecule and not having a flash point as obtained by standard methods

NOTE Examples for halogenated solvents are:

- dichloromethane (methylene chloride);
- HCFC 123, HCFC 141B and HCFC 225;



- trichloroethylene;
- tetrachloroethylene (perchloroethylene).

These halogenated solvents used in industry can contain a small quantity of stabilising agents (anti-acid, anti-oxidant, etc).

### 3.2

#### **vapour zone**

space within the cleaning machine filled with saturated solvent vapour when the cleaning machine is on stand-by

### 3.3

#### **freeboard zone**

space within type II-cleaning machines above the vapour zone and up to the rim of the tanks. The freeboard zone can be further divided into cooling zone, safety zone, refrigerated zone (see Annex A)

### 3.4

#### **cooling zone**

space within the freeboard zone of a cleaning machine above the vapour zone and up to the upper part of the condensing cooling coil

### 3.5

#### **safety zone**

space within the freeboard zone of a cleaning machine above the cooling zone up to the rim of the tank

### 3.6

#### **refrigerated zone**

space within the freeboard zone of a cleaning machine where its temperature is below 0 °C measured at a distance of 150 mm or more from the refrigeration cooling coils

### 3.7

#### **types of cleaning machines using halogenated solvents**

types of halogenated solvent cleaning machines used in this European Standard are defined below and examples shown in Annex A

#### 3.7.1

##### **type I - sealed system**

system in which there is no direct connection between any volume containing halogenated solvent and the outside environment during normal operation

##### 3.7.1.1

##### **type Ia - collection chamber system**

collection chamber system consists of a collection chamber and one or more process chambers with doors, one door sealing the collection chamber from the process chamber(s), the other from the outside environment (see Figure A.1)

##### 3.7.1.2

##### **type Ib - single chamber system**

single chamber system consists of a chamber which is used for both processing items and collecting halogenated solvent vapours for recovery (see Figure A.2)

#### 3.7.2

##### **type II - enclosed open system**

system in which there is no connection between halogenated solvent and the outside environment during normal operation including loading and unloading. This cleaning machine consists of one or more open tank(s) within an enclosure. The items are processed through the cleaning machine by means of mechanical handling device and solvent fumes are collected at the inlet and outlet points of the enclosure (see Figure A.3)

### 3.8

#### **piston effect**

rising or escaping of vapours caused by excessive speed in relation to the volume of the item by which it is introduced into or extracted from the vapour zone

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## 3.9

**open tank**

tank in which there is communication between solvent and the outside environment during normal operation, including loading and unloading

## 4 List of significant hazards

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

Clause/sub-clause of this European Standard	Hazard	Clause/sub-clause of EN 12921-1:2005
4.1	<p><b>General</b></p> <p>This clause contains significant hazards, hazardous situations and events, as far as they are dealt with in this European Standard, identified by risk assessment as significant for this type of machinery using halogenated cleaning liquids and which requires action to eliminate or reduce the risk.</p> <p>NOTE Information on the method of risk analysis is given in EN 1050.</p>	4.1
4.2	<b>Mechanical hazards</b>	4.2
4.2.1	<b>Crushing, shearing, cutting, entanglement, drawing-in, impact</b>	4.2.1
4.2.2	<b>High pressure fluid ejection</b>	4.2.2
4.2.3	<b>Ejection of parts of the cleaning machine and/or items</b>	4.2.3
4.2.4	<b>Mass and stability and inadequacy of mechanical strength</b>	4.2.4
4.2.5	<b>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

Table 1 (continued)

Clause/sub-clause of this European Standard	Hazard	Clause/sub-clause of EN 12921-1:2005
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, fumes and dusts</b>	4.6.2
4.6.2.1	<b>Inhalation of dangerous vapours</b> These hazards are related to: <ul style="list-style-type: none"> <li>— drag-out and idling by the cleaning machine while in operation;</li> <li>— filling, emptying and/or cleaning the cleaning machine;</li> <li>— damaged sealing around door leading to halogenated solvent vapour leaks;</li> <li>— opening of doors, vent valves and automatic closures before halogenated solvent purged to a safe concentration on type I-cleaning machines;</li> <li>— failure of vapour limiting device.</li> </ul>	
4.6.2.2	<b>Substances generated by chemical decomposition</b> These hazards are related to: <ul style="list-style-type: none"> <li>— solvent overheating due to the increased concentration of contaminants (high boiling oils, hydrocarbons, tar, etc.);</li> <li>— over temperature by the heating system;</li> <li>— chemical reactions between halogenated solvent and water (present on the items to be cleaned due to humidity condensation or other sources);</li> <li>— halogenated solvent breakdown due to radiation, e.g. UV light;</li> <li>— halogenated solvent breakdown due to high temperature from external sources (e.g. flames);</li> <li>— halogenated solvent breakdown due to reaction caused by reactive metal fines and swarf acting as a catalyst (e.g. zinc, magnesium, aluminium).</li> </ul>	
4.6.3	<b>Fire and explosion hazard</b> See 4.6.3.1 and 4.6.3.2 of EN 12921-1:2005. Fire or explosion hazards are caused by presence of flammable vapours (in hazardous explosion mixtures) together with a potential ignition source. Flammable vapours can be originated from total loss of halogenated solvent and overheating of combustible contaminants. Vapours produced within the flammable region and a high energy source being present. NOTE The risk of fire or explosion is extremely low with halogenated solvents during normal operation.	4.6.3
4.7	<b>Hazards combinations</b>	4.7
4.8	<b>Hazards caused by failure of energy supply</b>	4.8
4.9	<b>Hazards related to failure of control system</b>	4.9

**EN 12921-4:2005 (E)****5 Safety requirements and/or measures****5.1 General**

Machinery shall comply with the safety requirements and/or protective measures of this clause. In addition, the cleaning machine shall be designed according to the principles of EN ISO 12100-2 for hazards relevant but not significant which are not dealt with by this European Standard (e.g. sharp edges).

The common safety requirements or measures for cleaning machines using liquids or vapours in 5.1 of EN 12921-1:2005 shall be considered.

The intended use shall be determined and explained/defined in the instruction handbook and, when necessary, by other additional means (plate, sign, labelling, etc.) in accordance with and/or limited by the properties of halogenated solvents either pure or as a mixture indicated in the safety data sheet.

**5.2 Mechanical hazards****5.2.1 Safeguarding of danger points****5.2.1.1 General**

Shall be according to 5.2.1.1 of EN 12921-1:2005.

**5.2.1.2 Safety measures against crushing, shearing, cutting, entanglement, drawing-in, impact**

Shall be according to 5.2.1.2 of EN 12921-1:2005.

**5.2.1.3 Guards and interlocks**

Shall be according to 5.2.1.3 of EN 12921-1:2005.

**5.2.1.4 Moving parts of the cleaning machine**

Shall be according to 5.2.1.4 of EN 12921-1:2005.

**5.2.1.5 Location of controls**

Shall be according to 5.2.1.5 of EN 12921-1:2005.

**5.2.1.6 Prevention against the hazard from close or fall of covers, lids and doors**

Shall be according to 5.2.1.6 of EN 12921-1:2005.

**5.2.1.7 Devices for setting-up, make-ready, cleaning and trouble-shooting during the work process**

Shall be according to 5.2.1.7 of EN 12921-1:2005.

**5.2.2 Safety measures against high pressure fluid ejection****5.2.2.1 General**

Shall be according to 5.2.2.1 of EN 12921-1:2005.

**5.2.2.2 Safety measures against overpressure**

Shall be according to 5.2.2.2 of EN 12921-1:2005.