

ATEX INDUSTRIAL VACUUM  
SOLUTIONS AND SAFETY  
SYSTEMS



# INTRODUCTION

Safety is an integral component of Nilfisk philosophy in the development of industrial vacuum cleaners, pneumatic conveyors and centralized vacuum systems.

We offer an extensive and effective range of dust containment systems to meet safety requirements in environments where there is a risk of explosion (ATEX), and in those where dust is a real hazard for human health and the environment.

This publication provides an overview of the applications, legislation and technical considerations for industrial vacuum cleaners, offering solutions for professionals all over the world.

Nilfisk is part of the multinational Nilfisk-Advance Group, which has been operating throughout the world for over 100 years.



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# ATEX - EXPLOSIVE DUST AND GASES

## WHAT IS ATEX?

ATEX is an acronym/abbreviation for "Atmosphères Explosibles".

The set of ATEX Directives and Standards is the EEC reference for protection against the danger of explosion in the presence of flammable gas and/or dust.



The explosive atmosphere can contain flammable gases, mists or vapors, or combustible dust. If there is a sufficient concentration of these substances, mixed with air, an ignition source can cause an explosion.

Nilfisk manufactures ATEX-certified industrial vacuum cleaners used by companies dealing with the above hazards.

In particular, EEC Directive 89/391 (1989) on the implementation of measures to improve health and safety at work, deals with the risk of explosions.

Directive 2009/104/EC (on minimum safety requirements) further consolidated the concept of the adequacy of equipment - industrial vacuum cleaners in this case.

## SPECIFIC ATEX LEGISLATION

EEC Directive 89/391 (in addition to the Machinery Directive, pressure equipment) led to two ATEX Directives:

1. Directive 99/92/EC (formerly called Atex 118a or 137) on minimum requirements for improving the health and safety protection of workers potentially at risk from explosive atmospheres. Compulsory from 1/7/2003.
2. Directive 94/9/EC (formerly called ATEX 100a or 95) on the approximation of the laws of Members States concerning equipment and protective systems intended for use in potentially explosive atmospheres. Compulsory from 1/7/2003.

# HOW DOES DUST AND GAS EXPLODE?

The conditions necessary for an explosion or fire to occur are: the presence of a combustible substance, oxygen and an ignition source. There are upper and lower limits of the combustible concentration (gas or dust) in the atmosphere that are determinants of the possibility of an explosion being triggered. In the case of dust in particular, a particle size that improves dispersion in the air plays a fundamental role.

When using industrial vacuum cleaners, air and therefore oxygen, is always present, and there are also dust clouds and possibly flammable gas or vapor. Therefore, two of the three elements that can generate the explosion are always present: air and a combustible material.

” ATEX certified Nilfisk industrial vacuum cleaners eliminate the third parameter: the trigger. The vacuum cleaners are designed to prevent the triggering of any source of ignition, making vacuum cleaning operations safe “

## WHAT KIND OF DUST IS COMBUSTIBLE?

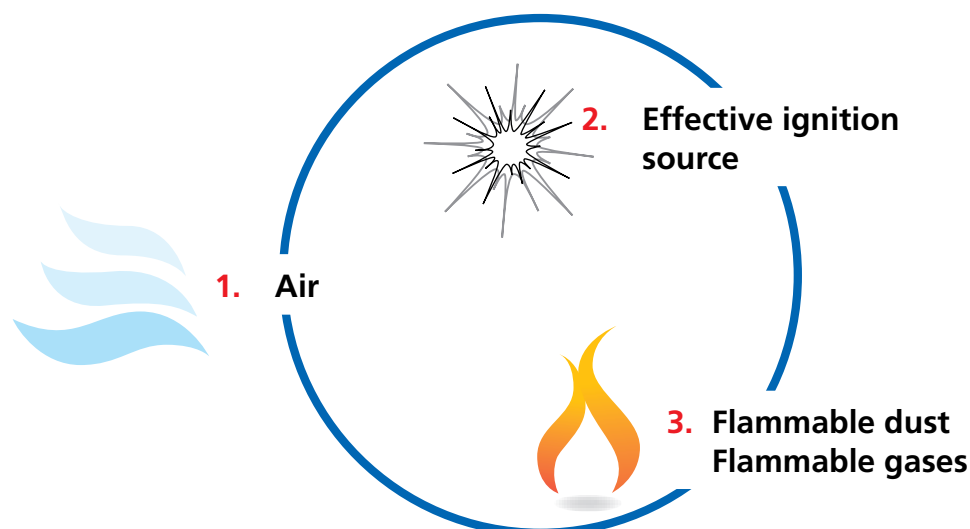
Some examples of combustible dust include: cereals, flour, starch, sugar, animal feed, light metals, coal, plastics, textiles, etc. in particular:

- **Solid particles** equal to or smaller than 500 microns, flying and suspended in air. If ignited these dusts can form explosive mixtures with air at atmospheric pressure and normal temperatures.
- **Combustible flakes and fibers which may be suspended in air.** These are solid particles, including fibers, larger than 500 microns.
- **Conductive dust**, in other words with an electrical resistivity less than or equal to  $10^3 \Omega \cdot m$ .

## WHAT TYPES OF GASES ARE COMBUSTIBLE?

Propane, ethylene and hydrogen are examples, but also gases generated by the evaporation of organic solvents such as alcohols, hydrocarbons, acetone, xylene, turpentine, lubricating oils, etc.

**Nilfisk vacuum cleaners prevent the trigger of potentially explosive mixtures**



# HOW CAN YOU PREVENT DUST OR GAS EXPLOSIONS?

## 1. THE AREA OF USE OF THE VACUUM CLEANER

Areas where there is a risk of explosion are divided into zones on the basis of the frequency and duration of the presence of explosive atmospheres.

### DUST

*Zone 20:* An atmosphere where a cloud of combustible dust in the air is present frequently, continuously or for long periods.

*Zone 21:* An atmosphere where a cloud of combustible dust in the air is likely to occur in normal operation occasionally.

*Zone 22:* An atmosphere where a cloud of combustible dust in the air is not likely to occur in normal operation but, if it does occur, will persist for only a short period.

### GASES, VAPORS AND MISTS

*Zone 0:* An atmosphere where a mixture of air and flammable substances in the form of gas, vapor or mist is present frequently, continuously or for long periods.

*Zone 1:* An atmosphere where a mixture of air and flammable substances in the form of gas, vapor or mist is likely to occur in normal operation occasionally.

*Zone 2:* An atmosphere where a mixture of air and 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 only a short period.

## 2. THE CATEGORY OF THE VACUUM CLEANER

Equipment approved for use in ATEX zones must be used in ATEX-classified Zones. The equipment is classified in Categories of use related to the Zones.

Zone of use	Machine category	Gas/Dust suffix
0 -20	1	G - D
1 - 21	2 or 1	G - D
2 - 22	3 or 2 or 1	G - D

### GROUPS

The categories are part of Application groups

**Group I:** mines

**Group II:** all surface activities other than mining

The ATEX Directives clearly separate the responsibilities for the classification of the Work Zone and the classification of the Categories of machine application, suitable for use in ATEX Zones:

- The customer has the responsibility for defining/ classifying the Zone (work area) where the machine will be installed/used.**
- The machine manufacturer is responsible for supplying a machine that meets the customer's requirements. A declaration of conformity must be issued with the machine.

- All industrial vacuum cleaners are in Group II
- Zones 0 or 20 are usually only found inside equipment, and personnel are not normally present in these conditions.
- As described above, the Categories are divided into Gas (G) and Dust (D), Gas and Dust may also be present simultaneously (G/D).
- The ATEX Directive also requires that the machine is marked with the symbol EX in a yellow hexagon.



# HOW CAN YOU PREVENT DUST OR GAS EXPLOSIONS

## WHAT ARE THE MOST COMMON SITUATIONS IN WHICH YOU NEED TO USE A VACUUM CLEANER SUITABLE FOR PREVENTING DUST OR GAS EXPLOSIONS?

### DUST

Transporting and/or transferring dust or cleaning activities in the following sectors: food, animal feed, pharmaceuticals, herbal medicines, liquors, detergents, industrial, woodworking, plastics, paints, chemicals, petrochemicals, power generation, recycling.



### GAS

Petrochemical, liquors, herbs, service stations/fuel distribution, manufacturing paints, washing with solvents, chemicals, industry and maintenance, surface mining/metallurgical, bio-energy.



# ATEX - LEGISLATION

## LEGISLATION CONCERNING INDUSTRIAL VACUUM CLEANERS

### CERTIFICATION

The ATEX directives establish safety principles to be met by manufacturers and users.

In Europe, standards are issued by the European Committee for Standardization to provide manufacturers with guidelines for the design and construction of machines. In fact, the minimum safety level required by the Directives issued in accordance with the New Approach principle, is considered to have been met if the product meets the EN standards.

” In terms of ATEX, equipment for use in Zones 2 and 22 are declared to conform under the manufacturer’s responsibility alone. Equipment for use in Zones 1 and 21 must obtain validation of the risk analysis by a Notified Body (third-party independent body of acknowledged competence in the European context) to issue the Declaration of Conformity. In this sense, Nilfisk has obtained specific certification from INERIS. “

### CERTIFICATION FOR THE USA, CANADA, CHINA, AUSTRALIA, NEW ZEALAND

While the ATEX directives are in force and applied in Europe, there are other similar regulations regarding the same issue of protection against fire and explosion such as IECEx and HazLoc enforced in other parts of the world.

HazLoc and the relevant product certification are for the US and Canada. IECEx refers to the rest of the world: Australia, New Zealand and China in particular.

### PRODUCT MARKING

In accordance with the ATEX Directive, Nilfisk vacuum cleaners are marked with the following:

1. Ex II2G – Ex II2D – Ex II2GD
2. Ex II3G – Ex II3D - Ex II3GD

The ATEX Directive and EN standards for the sector require that the ratings plate of the machine (industrial vacuum cleaner) bears the above well-defined marks, in particular the symbol **Ex** in a yellow hexagon plus an indication of the Group (II), Category (2-3), Gas or Dust (G-D) and other additional information such as:

- Temperature class T....
- Gas Group IIA - IIB....
- Type of protection (d.....) if applicable
- IP degree of protection...
- Max Temp. (ex.: T 125°C)
- Other details pursuant to the specific application.





## ATEX PRODUCT MAINTENANCE

Maintenance is essential to ensure not only the functional characteristics of the product in time, but especially in the case of ATEX, to guarantee safety characteristics and protect operators.

The instruction manual that comes with each Nilfisk model, in addition to standard maintenance, includes an appropriately documented maintenance program for ATEX industrial vacuum cleaners to guarantee the validity of the declaration of conformity issued by Nilfisk in time.

If this maintenance is not performed, the declaration of conformity issued by the manufacturer is void and the industrial vacuum cleaner will be used under the sole responsibility of the user.



# ATEX - NILFISK PRODUCT RANGE

Nilfisk produces a wide range of ATEX-certified industrial vacuum cleaners, high-powered vacuum cleaners, pneumatic conveyors and centralized vacuum systems designed to respect the strictest safety standards.

Nilfisk ATEX-certified industrial vacuum cleaners trap dust, so they don't alter the classification of the Zone where they are used/installed. In the presence of gas, the vacuum cleaner traps any dangerous dust, but expels the gas from the outlet. The user should therefore consider whether it is appropriate to install ducts to pipe the outlet out of the environment.

Below you will find a practical overview of the wide range of Nilfisk ATEX-certified products, one of the most complete ranges available on the market today: from the mobile vacuum cleaner to the centralized vacuum system.

## INDUSTRIAL VACUUM CLEANERS

Industrial vacuum cleaners are the most flexible and fastest way to remove dust in an ATEX environment.



Single-phase



Three-phase up to 4 kW



7.5 kW three-phase up to 18.5



Compressed air

## HIGH-POWER VACUUM CLEANERS

ATEX-certified high-power vacuum cleaners offer important safety standards with truly incredible vacuum power.



# ATEX - NILFISK PRODUCT RANGE

## PNEUMATIC CONVEYORS

Pneumatic conveyors are designed to transport powders and granules from one point to another without changing the mix. These systems are often used to feed automatic machines. The ATEX versions abide by the safety standards used in food production and the chemical-pharmaceutical industry.



*Pneumatic conveyor (left) and capsule pusher (right), in a pharmaceutical company.*

## CENTRALIZED VACUUM SYSTEMS

Centralized vacuum systems are the ideal solution for vacuum applications required in several places simultaneously, and in large environments that may have very different features. ATEX certified systems are often the only choice for large industrial production.



*Centralized vacuum system in a chemical company: 2 vacuum units, 1 filter silo.*

# SAFETY SYSTEMS

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## DUST: HAZARDOUS FOR HEALTH

Machinery Directive 2006/42/EC applies in terms of the safety levels offered by industrial vacuum cleaners for applications in non-ATEX-classified zones. Normative EN 60335-2-69:

“Particular requirements for wet and dry vacuum cleaners, including power brush, for industrial and commercial use”

A (Type C) product standard which therefore defines the minimum requirements that an industrial vacuum cleaner must have to conform to the Machinery Directive and therefore safe. In addition to the constructive and functional requirements, this normative also contains Annex AA referring to vacuum cleaners for hazardous dust:

“Particular requirements for vacuum cleaners, suction sweeping machines and dust extractors for the collection of dusts hazardous to health”

EN 60335-2-69 provides the following definition of hazardous dust:

“Non-radioactive dust, hazardous to health if inhaled, swallowed or in contact with the skin (see also Directives 79/831/EEC and 67/548/EEC). Micro-organisms are considered dust hazardous to health. Asbestos is classified as one of the above hazardous dusts.”

**Nilfisk industrial vacuum cleaners meet the above requirements, offering high safety standards to protect the operator and the environment.**

**In particular, air filtration and dust containment and disposal systems prevent any form of pollution.**



## FILTRATION, CONTAINMENT, SEPARATION, DISPOSAL

### FILTRATION

Annex AA indicated in the previous paragraph, divides vacuum cleaners for hazardous dust into three Classes of use:

Class L - Dust representing a moderate risk - The vacuum cleaner filter traps over 99 % of dust with a grain size of under 2 microns

Class M - Dust representing a medium risk - The vacuum cleaner filter traps over 99.9 % of dust with a grain size of under 2 microns

Class H - Dust representing a high risk - The vacuum cleaner filter traps over 99.995 % of dust with a grain size of under 1 micron

The filtering characteristics are guaranteed by both tests performed on the machine as whole and tests performed on each of the filters installed. A filter efficiency certificate is issued for each machine in Class H.

Nilfisk tests its industrial vacuum cleaners to make sure they meet the above requirements in international laboratories (IMQ, TUV, SLG). In addition to the initial tests done on the product, these bodies also perform periodic tests at Nilfisk to guarantee continuity of performance over time.

Dust class	Suitability for hazardous dust with limit values for occupational exposure $\text{mg x m}^{-3}$	Degree of Penetration D %
L (light hazard)	> 1	< 1
M (medium hazard)	$\geq 0,1$	< 0,1
H (high hazard)	< 0,1 including carcinogenic dusts and dusts contaminated with carcinogens and/or pathogens	< 0,005

### SEPARATION

Nilfisk supplies specific systems to extend the range of materials that can be cleaned using its vacuum cleaners also for extreme situations such as in the presence of liquids, high temperatures, fibrous materials, etc., hazardous dust and materials representing a health risk, or ATEX-classified materials. Ancillary equipment guarantees safety for the operator during collection and disposal.

### Disposal and storage

The management of hazardous dust and materials is not limited solely to collection and must also consider disposal management.

For this reason, always within the scope of the above EN normative, all Nilfisk vacuum cleaners can be equipped with specific disposable containers or bags to easily dispose of the collected material. Moreover, Class H vacuum cleaners are always supplied with such systems, as required by standard EN60335-2-69.



# SAFETY SYSTEMS

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## NILFISK PRODUCT RANGE

No safety compromises.

As well as manufacturing industrial vacuum cleaners designed to guarantee safety and prevent the risks of explosion or pollution, Nilfisk also provides its customers with a wide range of dust containment solutions.

Absolute (HEPA or ULPA) filters for both vacuum and blower function to trap even the smallest particles, cartridge filters to trap very fine dust, air diffusers to guarantee a draft-free environment, bag-in bag-out filter systems for hazardous substances, unloading systems that prevent operator contact with the collected material, etc.

Visit the site [industrial-vacuum.nilfisk.com](http://industrial-vacuum.nilfisk.com) for a free accessories catalogue, including optionals and separators for your vacuum: you'll find the perfect solution to meet your own specific requirements.



*Upstream absolute filter*



*Downstream HEPA filter*



*Cartridge filter*



*Air outlet diffuser*



*Bag-In Bag-Out filter system*



*Safe Bag filter*



*Longopac® "endless" collection system*

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