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Kiekens is an international company specialising in the design, supply, installation and maintenance of dust extraction systems, industrial vacuum cleaners and fans. We offer both series produced, as well as customer-specific systems suitable for a wide range of applications.

What is ATEX?

Kiekens delivers many of its products with ATEX certification both for dust and gas zones. ATEX is the abbreviation of ATmosphère EXplosible, French for an explosive atmosphere. Legislation and regulations has set this down using the following definition: An explosive atmosphere

contains a mixture of air and combustible substances in the form of gases, fumes, mists or dust under atmospheric conditions in which the combustion will spread after ignition to the entire not yet ignited mixture.



How does an explosion occur?

For an explosion to take place three factors are needed:

- Fuel (combustible substance or gas)
- Oxygen (air)
- Source of ignition (electrical or mechanical)

Combustible materials represent an explosion risk when there is the correct mixture ratio with oxygen. Every combustible material has its own mixture ratio in which an explosive mixture is formed. A minimum and maximum mixture ratio; the "lower explosion level" (LEL) and the "upper explosion level (UEL).

To whom does ATEX apply?

The area of application comprises locations where an explosive environment can occur because of local and company conditions.

The cause of this can be: Mixtures of oxygen and flammable substances in the form of gases, fumes, mists and dust under atmospheric conditions in which the combustion expands after ignition to all of the non-combusted mixture.

ATEX 114 and 153

The difference between both directives is that ATEX 114 (Directive 2014/34/EU) is applied to the manufacture of systems and products (machines and CE directive) and that ATEX 153 (Directive 1999/92/EC) is applied to the environment, procedures and instructions of employees (social directive and health and safety legislation and regulations). Both directives apply to Ex environments.

The objective of this combination of directives is to safeguard the health and safety of employees in zones where there is an explosion risk.



A zone prone to an explosion risk must be clearly marked with a warning triangle that shows the "Ex" text in black on a yellow background.

Explosion-safe equipment that has been made suitable by manufacturers in accordance with the ATEX directive for use in zones where there is an explosion risk must be marked with the "Ex" logo in a hexagon. This logo is also shown in black against a yellow background.

A zone where there is an explosion risk can be classified based on the following hazard zones. Hazard zone description in accordance with NPR 7910-2 or local legislation



Gas zones

Zone	Description
0	Zone in which an explosive atmosphere that is a mixture of air with combustible substances in the form of gas, fumes or mist is continuously or regularly present (>10% of the operating time).
1	Zone in which an explosive atmosphere that is a mixture of air with combustible substances in the form of gas, fumes or mist can be expected during normal operation or is sometimes present (0.1 to 10% of the operating time).
2	Zone in which an explosive atmosphere that is a mixture of air with combustible substances in the form of gas, fumes or mist is unlikely during normal operation and within which such an atmosphere, if present, will only exist rarely and during short periods (< 0.1% of the operating time).

Dust zones

Zone	Description
20	Zone in which an explosive atmosphere is present continuously or regularly (>10% of the operating time). This mainly occurs within equipment.
21	Zone in which an explosive atmosphere can be expected during normal operation or is sometimes present (0.1 to 10% of the operating time) or a zone where basically there is always a dust deposit.
22	Zone in which an explosive atmosphere is unlikely during normal operation and within which such an atmosphere, if present, will exist only rarely and for short periods of time (< 0.1% of the operating time) or a zone where there is a dust deposit so now and again.

The dust filter itself also falls within the zone classification.

Explosion characteristic of extracted dust

First, the explosion characteristic must be determined in order to select the correct protection for a system. If it is unknown, Kiekens can determine it in close partnership with an accredited partner.

When making this determination, first, a screening test is performed to establish whether the dust is actually explosive. "Not explosive" means that the

sample will not ignite with a 10 joule ignition energy. If this, however, is the case, the test is continued to determine the explosion characteristic through a standardised test.

The LEL (lower explosion limit), the maximum explosion pressure P_{max} and the maximum pressure increase speed K_{st} value will, for example, be determined within this context.

Kst value (m.bar/s)		Dust class (Dust)
> 0	to 200	1
> 200	to 300	2
> 300	>	3

P_{max}

The maximum overpressure that occurs during the test is shown as P_{max} .

Kst value

Based on the maximum pressure increase speed, the dust explosion constant is determined and shown. Expressed as the "Kst value". This value is an indication for the intensity of the explosion.

Based on this dust explosion constant, the dust sample can be classified in 3 dust explosion classes.

Explosion protection

In most common situations, it is basically impossible to prevent that the lower explosion limit (LEL) within the dust filter is not exceeded, that is, situations when a flammable substance is extracted.

Kiekens dust filters that are suitable for use in an ATEX zoned environment or for suctioning a flammable substance are protected in different ways to ensure that the dust filter itself does not become a source of ignition.

The Dustmasters that are also suitable for extraction flammable substances also have a brass inlet funnel and pulley for the fan impeller. This will prevent sparks forming in the exceptional case that an error occurs in the impeller.

This ensures that the fans meet the EN-14986 standard: "Design of fans working in potentially explosive atmospheres".

If a dust explosion should occur in the filter anyway, we have ensured that the Kiekens ATEX Dustmaster is pressure-, impact- and shock-resistant. Kiekens has an extensive range of active and passive protection systems to disperse the created overpressure safely or to smother it as from the start.

Protection components

Explosion bursting disc

By using an explosion bursting disc in combination with a pressure-resistant filter housing, the filter will have a "preprogrammed" weak spot: the explosion bursting disc. If there is an explosion, the explosion bursting disc will open in a controlled manner, which will ensure that the pressure in the filter drops and safety is safeguarded. The discharge of the flame front must take place in a safe zone that may include the use of an explosion relief channel or a flame arrester.



Explosion bursting disc activation sensor

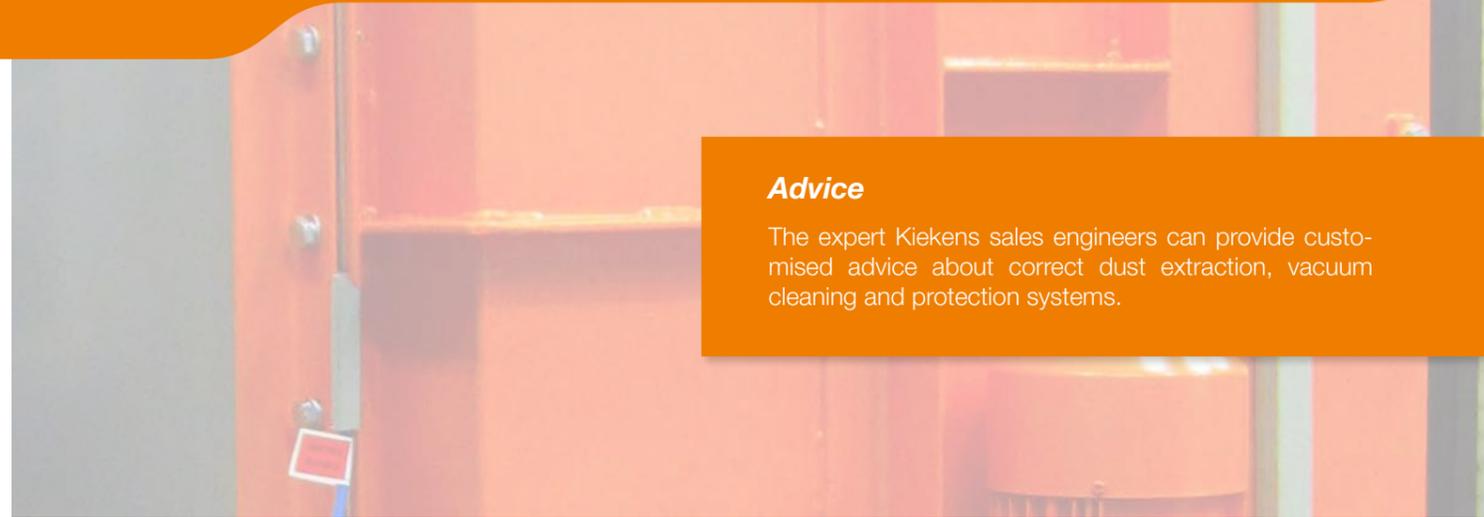
The bursting disc activation sensor detects the opening of the bursting disc. The system can be stopped through this signal and you will prevent that additional oxygen is fed to an explosion/fire (jet pulse filter cleaning and fan). The circuit is provided intrinsically safe.



Flame arrester

The flame arrester will remove the explosion pressure without there being a risk of flames being produced. If the system is set up in a location where there is no option to discharge the created overpressure through a relief channel, you can install a flame arrester over the explosion bursting disc. The flame arrester does not require maintenance, only a regular inspection.





Advice

The expert Kiekens sales engineers can provide customised advice about correct dust extraction, vacuum cleaning and protection systems.



Isolation valve for the inlet duct

An explosion may be propagated through the suction pipe and, therefore, represent a risk for operators and the surrounding area. A passive explosion isolation valve can be used to prevent that flames and pressure are propagated/spread within the system through the suction pipe system.

It will work autonomously and, therefore, a separate control system will not be required. If an explosion occurs, the valve will be closed at top speed by the pressure front that will then move through the inlet duct.



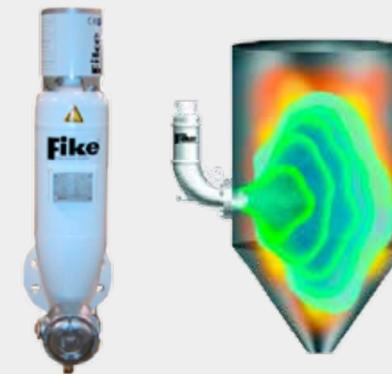
Isolation valve for clean air duct

The check valve for the clean air duct can be applied depending on the filter type to be protected. If an explosion occurs and there is a pressure build-up, the valve will close automatically and, therefore, the airflow to the fan will be obstructed.



Quick response valve

An explosion may be propagated through the suction pipe and, therefore, represent a risk for operators and the surrounding area. The quick response valve will protect the inlet duct in systems where dust with higher Kst values are extracted. The control module monitors the dust extraction system through various sensors and, if an explosion occurs, it will shut off the inlet duct in a fraction of a second.



Explosion suppression

Explosion suppression will suppress an explosion at an early stage and will prevent further pressure build-up. Explosion suppression is, for example, used if dust or hybrid mixtures are suctioned with higher Kst values or when there is a risk to health. Dust emission will not occur because the system will remain completely closed. The explosion suppression system has a control module and different sensors that monitor the dedusting system and activate fire-extinguishing agent containers in case of an explosion.



Dust detection sensor

The dust detection sensor is positioned in the clean air space of the filter. Dust leaks to the clean air location will be detected by using a dust sensor and the system can be safely stopped. The ATEX zoning of the fan will no longer apply and any dust emissions to the environment will be prevented because of this.



Rotary valve

The rotary valve has been designed in such a way that it will not represent a source of ignition and will form a barrier in case of an explosion. You can use an ATEX rotary valve to insulate the dust filter from the dust discharge and to create a barrier that is flame- and pressure-resistant. This will ensure that flames and the pressure wave remain safely in the filter housing. The inside of the ATEX rotary valve is suitable for zone 20 and the outside is suitable for zones 1, 2, 21 and 22 depending on the model.