ATEX solutions from **AERZEN**

Positive Displacement Blowers,
Screw Blowers and Screw Compressors,
built in accordance with
Directive 2014/34/EU

AERZEN
EXPECT PERFORMANCE

AERZEN your partner in ATEX compliance

Directive 2014/34/EU finds increasing application in chemical and process technology industries. The law entered effect on December 12, 1996; see also the eleventh regulation of the product safety law (explosion protection regulation). Beyond supporting the crucial priority of safety and consumer protection, standardising requirements across Europe will promote the free exchange of goods within the EU. It is increasingly important that manufacturers make the following clear to their customers prior to selecting the equipment: explosion protection must be planned for in advance.

Two Directives – A Single EU-wide Approach to Protection

- ATEX Product Directive 2014/34/EU (ATEX 114)
- ATEX Worker Protection Directive 1999/92/EC (ATEX 137)

The ATEX Product Directive 2014/34/EU regulates the commercialisation of products intended for use in areas at risk of explosion. The primary goal of the product directive is to protect persons who work in explosion-prone areas, or in areas that could be affected by explosions. Since the directive's entering effect at the end of 1996, only those devices, components and protective systems that comply with ATEX Product Directive 2014/34/EU, may be commercialised for use in areas at risk of explosion.

By comparison, the ATEX Worker Protection Directive requires that employers (plant management) fulfill or comply with certain requirements pertaining to the health protection and safety of employees who are exposed to potentially explosive atmospheres. Plant managers are required to include an explosion protection plan as part of their risk assessment and to divide areas with potentially explosive atmospheres into zones.

The Ex-Design1 You Need

AERZEN positive displacement blowers, rotary lobe compressors and screw compressors are considered “Equipment” according to Directive 2014/34/EU. All AERZEN machines, components, and protective systems fall under Equipment Group II (trade, industry). Depending on their application, they are divided into three categories. We take the following important information into account when designing machines that will completely satisfy your safety requirements:

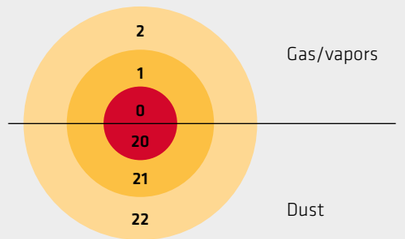
- Ex-zone
- Type of gas or dust
- Internal zone (pipeline, container, etc.) and/or external zone (surrounding area)
- Explosion group
- Temperature class (for gases) and/or ignition temperature (for dust)
- Frequency inverter operation yes/no
- Ambient temperature

Equipment Categories 1 to 3

Equipment Group II Equipment for industrial use in Ex-areas; hazard from mixtures of air and flammable materials in the form of gases, vapours, mists, or dusts						
Equipment category according to EC directive	**Category 1**		**Category 2**		**Category 3**	
Hazard	Constant, frequent, or over longer periods (> 1000 h per year)		Occasional, random (10 to 1000 h per year)		Infrequent and short duration (< 10 h per year)	
Safety level	Very high		High		Normal	
Zone designation	Zone 0	Zone 20	Zone 1	Zone 21	Zone 2	Zone 22
Ex-Atmosphere	G (gas)	D (dust)	G (gas)	D (dust)	G (gas)	D (dust)

Dust or Gas: the Ex-atmosphere.

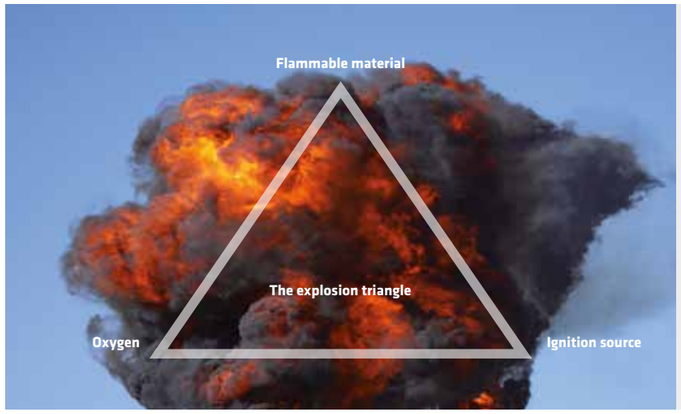
- Permanent hazard
- Hazardous conditions during normal operation
- Hazardous conditions limited to system failure (temporary)



Explosion Groups and Temperature Classes.

	Temperature classes	T1	T2	T3	T4	T5	T6
	Ignition range of the explosive mixture		300° C – 450° C	200° C – 300° C	135° C – 200° C	100° C – 135° C	85° C – 100° C
	Max. surface temperature*	450° C	300° C	200° C	135° C	100° C	85° C
Explosion groups for gases	**I**	Methane					
	II A	Acetone, ammonia, methane, methanol, propane, toluene	Ethyl alcohol, n-butane	Diesel, gasoline	Acetaldehyde, diethyl ether		
	II B	Communal gas (Coal gas)	Ethylene	Hydrogen sulfide			
	II C	Hydrogen	Acetylene				Carbon disulfide
Explosion groups for dust	**III A**	Flammable lint					
	III B	Non-conductive dust with specific electrical resistance > 10^3 Ωm => el. equipment must be protected to at least IP 5x					
	III C	Conductive dust with specific electrical resistance < 10^3 Ωm => el. equipment must be protected to at least IP 6x => the requirements of the following higher zone apply (Zone 22 becomes Zone 21)					

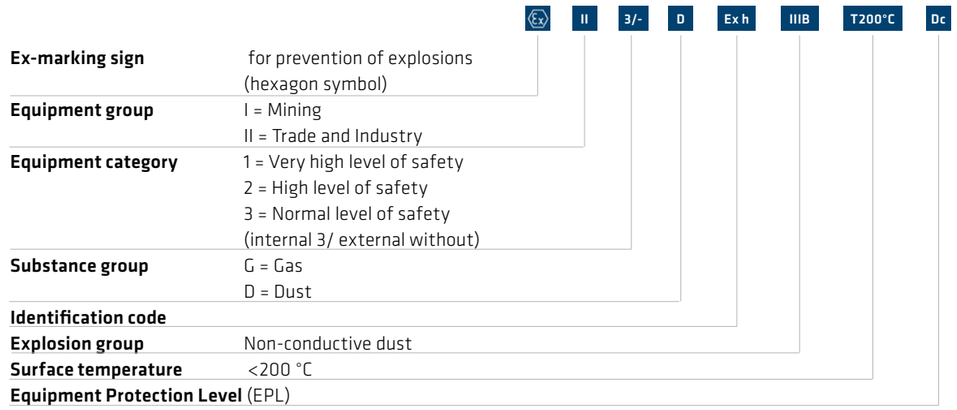
** Defined by how the equipment or equipment components are to be used*



ATEX is a contraction from the French “ATmosphère EXplosible” and is used for the European directive covering equipment and protective systems used in areas at risk of explosion.

Each plant component will be certified. In addition, AERZEN discharge silencers base plates are certified as spark arresters by TÜV Nord.

Typical labelling in accordance with Directive ATEX 2014/34/EU.



Ex-marking sign	for prevention of explosions (hexagon symbol)
Equipment group	I = Mining II = Trade and Industry
Equipment category	1 = Very high level of safety 2 = High level of safety 3 = Normal level of safety (internal 3/ external without)
Substance group	G = Gas D = Dust
Identification code	
Explosion group	Non-conductive dust
Surface temperature	<200 °C
Equipment Protection Level (EPL)	

Industries and typical applications

Biogas compression

Chemical industry

Refinery

Power plant

Environmental technology

- Biogas compression
- Natural gas compression
- Gas feed

Food and plastics industries

- Pneumatic conveying
- Silo loading and unloading

Chemical and pharmaceutical industries

- Gas conveying
- Degasification

Refineries

Power plants

Made by **AERZEN**
Efficiency and maximum safety in every zone

For years, compressors and blower packages “made by AERZEN” have been regularly used in highly critical areas. The know-how and experience that we have gathered over the decades regarding practically every type of application are reflected especially in the processes that fall under the ATEX directive. AERZEN offers its customers a range of solutions for ATEX zones that is unique in its scope and effectiveness: A good starting point when it comes to meeting ever more stringent requirements safely and economically.

Your Requirements: Our Guide for ATEX-compliant Designs

Sound advice is the key to success. This is especially true when planning for applications in Ex-areas. This is why we place great emphasis on careful preparation. Our engineers will discuss the details of your project with you well in advance and assemble all ATEX-relevant information (further details on page 3): That is the prerequisite for meeting ATEX zone requirements when designing equipment suited to a set application.

Remarkable Diversity: the ATEX portfolio from AERZEN.

Positive pressures								
ATEX equipment	**Internal Ex-atmosphere (intake from Ex-zone)**				**External Ex-atmosphere (Ex-free intake)**			
	1	21	2	22	1	21	2	22
Delta Blower	x	x	x	x	x	x	x	x
Delta Hybrid				x		x		x
Delta Screw				x	x	x	x	x

Negative pressures								
ATEX equipment	**Internal Ex-atmosphere (intake from Ex-zone)**				**External Ex-atmosphere (Ex-free intake)**			
	1	21	2	22	1	21	2	22
Delta Blower	x	x	x	x	x	x	x	x
Delta Hybrid				x		x		x
Delta Screw				x	x	x	x	x

Made to Order: Complete ATEX Solutions from a Single Source

With AERZEN products, customers benefit from a comprehensive solution to all theirATEX-compliant equipment needs. Our ATEX specialists will design the proper assembly for you – including all associated features (see below). The design includes all necessary documentation and accessories to meet the conditions of ATEX Product Directive 2014/34/EU. Moreover, our engineers will review and, if necessary, implement further customer requests pertaining to equipment design in view of complying with Directive 2014/34/EU (ATEX). In addition to engineering experience based on decades of work with facilities of all sizes, we offer our customers a number of other significant advantages:

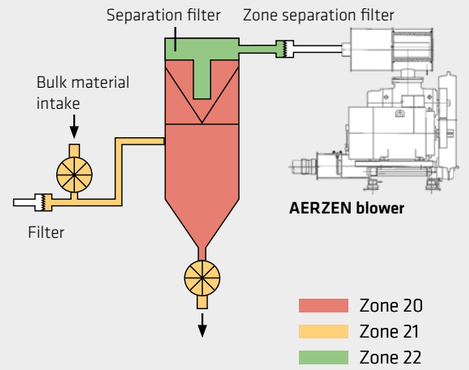
- Comprehensive advice from the AERZEN team of experts
- Equipment conforming to Directive 2014/34/EU
- Complete documentation
- Adherence to legal requirements
- Complete solutions from a single source

ATEX Solutions from AERZEN: Always an Idea ahead

Regardless of whether it is to be used for positive or negative pressure applications, high-performance AERZEN equipment is the right solution for your ATEX zone: TÜV tested, of course. According to product group and zone type, our technologies have different designs. Features may include:

- Zone separation filter
- Special documentation
- Use of specialised materials for components in contact with the medium
- Ex-instrumentation
- Vibration monitoring
- Spark arrester
- Special motors designed for a specific zone

Example: vacuum pneumatic conveying.
AERZEN zone separation filter:



Explosion Protection in Pneumatic Bulk Material Conveyance

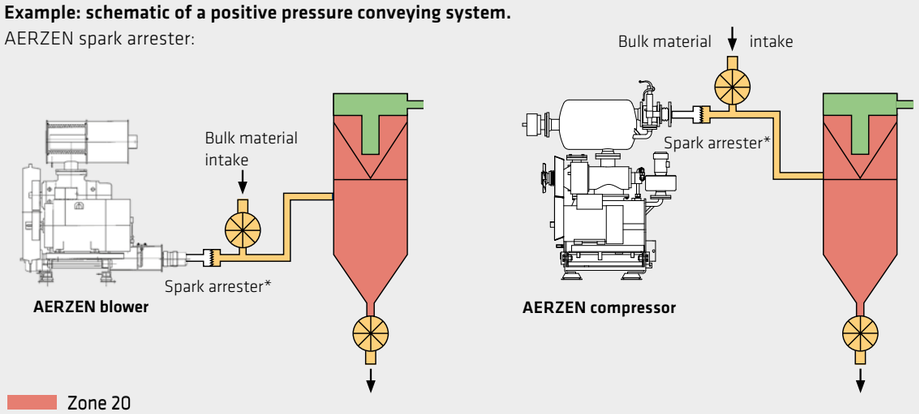
Flammable or explosive mixtures can occur in the pneumatic conveyance of combustible or flammable bulk materials. For this reason, system components may have to be designated for different zones to ensure all necessary protective standards are met (see illustration).

AERZEN can provide ATEX designs for all system components to ensure explosion protection. According to the ATEX Directive, Zone 21 must provide explosion protection measures even in case of malfunction. That is why the AERZEN safety concept always takes exceptional malfunctions into account.

Depending on product and plant configuration, bulk materials are transported either by means of positive pressure or vacuum pneumatic conveying. During vacuum operation, it is important to ensure that no flammable dust-air mixtures enter the blower due to functional problems in the separator filter (for example filter rupture). To this end, an additional filter element (sentinel filter) is usually added during plant construction. This often means additional time and expense for design, assembly, and installation, which is why AERZEN developed a TÜV-tested filter element (sentinel filter or zone separation filter) integrated into the intake silencer. The filter is monitored by measuring its pressure drop, offering our customers a decisive advantage: they no longer need to figure a sentinel or zone separation filter into their scope of supply.

One problem that is often overlooked in pneumatic conveying systems is that inadequate maintenance can result in the blower producing sparks that, when blown into the conveying pipe (positive pressure conveying), can ignite dust-air mixtures. Organic dust-air mixtures can ignite at temperatures between 200° C and 500° C. During malfunction, sparks can reach temperatures of up to 1,000° C, making serious damage a possibility. A spark arrester integrated into the pressure-side silencer/base support prevents sparks caused by malfunction from reaching the hazardous zone. Spark arresters are no longer necessary – another decisive advantage for our customers. Retroactive certification of the spark arresters for previously delivered units can be provided under certain conditions.

Example: schematic of a positive pressure conveying system.
AERZEN spark arrester:



* Plant-side spark arresters are not necessary in AERZEN blowers and compressors

A typical ATEX blower package from AERZEN – operation-ready

Advantages of an integrated AERZEN solution:

- Customer savings
- Maintenance-free (spark arrester)
- Minimal pressure loss
- Energy-efficient
- Compact
- Discharge silencers free of absorption material
- 100% safe

The following components can be specifically configured for ATEX zones:

- Drive motor
- Belt drive
- Instrumentation, including pressure differential, vibration, and temperature monitoring
- Housing materials
- Suction-side components (filter silencer, sentinel or zone-separation filter)
- Gas warning device optional and provided by the customer
- Additional labelling, operation manuals and declaration of conformity in accordance with Directive 2014/34/EU
- Discharge silencer as spark arrester
- Additional component used on compressors: coupling

AERZEN. Compression is the key to our success

The Aerzener Maschinenfabrik GmbH was founded in 1864. In 1868, we built Europe's first positive displacement blower. The first turbo blowers followed in 1911, the first screw compressors in 1943, and in 2010 the world's first rotary lobe compressor package. Innovations "made by AERZEN" keep driving forward the development of compressor technology. Today, AERZEN is among the world's longest established and most significant manufacturers of positive displacement blowers, rotary lobe compressors, screw compressors and turbo blowers. And among the undisputed market leaders in many areas of application.

In more than 50 subsidiaries around the world, more than 2,600 experienced employees are working hard on shaping the future of compression technology. Their technical competence, our international network of experts and the continual feedback from our customers are the basis of our success. AERZEN products and services set standards. In particular, with regard to reliability, stability of value and efficiency. Challenge us.

LET'S TALK

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