



ALMECO®

Air and Water Technologies

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# ATEX Fans

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08/02/2008

Data subject to change without prior notice

ALMECO NV-SA

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## Introduction

1. What is ATEX?	1
2. Zones	1
3. Groups and Categories	2
3.1. Group I	2
3.2. Group II	2
3.2.1. Group II, Category 1	2
3.2.2. Group II, Category 2	3
3.2.3. Group II, Category 3	3

## Important Data

1. Flash point	4
2. Auto-ignition temperature	4
3. Lower and upper explosion limit (LEL & UEL)	4
4. Temperature class	5
5. Explosion Group	5

## Direct Driven Axial Fans

1. Conditions of use	6
2. Types of fans	6
2.1. AVK: Fan with integrated inlet bell	6
2.2. ADK: Short cased	7
2.3. ADL: Long cased	8
3. Fan houses	8
4. Impellers	9
5. Motors	10
5.1. Flameproof motors EExd	11
5.2. Increased safety motors EExe	11
5.3. Non-sparking motors EExnA	11
5.4. Dust ignition proof motors (DIP)	11
6. Material pairings	12
7. Speed regulation	13
8. Other voltage supplies	13

## Documents

1. ATEX Form	14
2. CE Declaration of conformity	15
3. Internal test certificate	16
4. Manual	17
5. Confirmation notified body for Cat. 2 fans	18

## Strengths Almecco

1. Own design	19
2. Large stock	19
3. Engineering and software	19
4. Co-operation and ERP	19



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## Introduction

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## 1. What is ATEX?

ALMECO NV manufactures several products, including axial fans in accordance with the ATEX Directive. This means: in accordance with economical Directive 94/9/EC.

ATEX stands for Atmosphères Explosives (Fr).

Directive 94/9/CE, often called ATEX 95, applies to all manufacturers of equipment (and protective systems) intended for use in potentially explosive atmospheres.

In addition to that, a social Directive 1999/92/EC, also known as ATEX 137, applies to all workshops where people work in a potentially explosive atmosphere.

The numbers 95 and 137 correspond with the articles from the Treaty establishing the European Community.

In a company where explosive atmospheres can appear, the risks must be evaluated and documented in accordance with Directive 1999/92/EC. Such a company must draw up an "Explosion protection document" which contains, among other things, a plan showing the different zones.

When equipment (and protective systems) must be placed within explosive atmosphere zones (zone 0, 1, 2, 20, 21 & 22), these will need to be built in accordance with Directive 94/9/EC.

### Notes:

- A directive must be observed by all member states of the European Union
- One may use European standards to prove conformity with the essential requirements of a directive
- So: Being a fan manufacturer, one is not obliged to use the standard EN 14986 "Design of fans working in potentially explosive atmospheres", but by using it within its limits, a presumption of conformity can be made

## 2. Zones

<b>Zone 0</b>	A 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
<b>Zone 1</b>			is likely to occur in normal operation occasionally
<b>Zone 2</b>			is not likely to occur in normal operation but, if it does occur, will persist for a short period only
<b>Zone 20</b>		an explosive atmosphere in the form of a cloud of combustible dust in air	is present continuously or for long periods or frequently
<b>Zone 21</b>			is likely to occur in normal operation occasionally
<b>Zone 22</b>			is not likely to occur in normal operation but, if it does occur, will persist for a short period only

Table 1



## 3. Groups and categories

In Directive 94/9/EG, equipment is divided into groups and categories. Almecco builds and sells fans of Group II, Category 2 and category 3.

	Group I		Group II		
	Category M1	Category M2	Category 1	Category 2	Category 3
Level of protection	Very high	High	Very high	High	Normal
Endangered by firedamp and/or combustible dust	Is endangered	Is likely to be endangered			
Danger by gas, vapour, mist or air/dust mixtures			Long periods or frequently	Likely to occur	Unlikely to occur, and if they do occur, only infrequently and for a short period
Required protection	2 Independent means / Or assured for 2 faults occurring independently	Also in case of more severe operating conditions	2 Independent means / Or assured for 2 faults occurring independently	Even in the event of frequently occurring disturbances or faults	Only during normal operation
Use	Mines and mining surface installations	Mines and mining surface installations	Gas: Zone 0, 1 & 2	Gas: Zone 1 & 2	Gas: Zone 2
			Dust: Zone 20, 21 & 22	Dust: Zone 21 & 22	Dust: Zone 22

Table 2

### 3.1. Group I

Equipment of Group I: Intended for use in underground parts of mines as well as those parts of surface installations of such mines, endangered by firedamp and/or combustible dust.

Equipment of group I is divided into 2 categories, M1 and M2.

Almecco does not build or sell fans for these categories.

### 3.2. Group II

Equipment of Group II: Intended for use in explosive atmospheres, other than mines or their surface installations.

#### 3.2.1. Group II, Category 1

Equipment (fans) of Category 1 is intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours or mists or by air/dust mixtures are present continuously, for long periods or frequently.

Almecco does not build or sell fans for this category.



### 3.2.2. Group II, Category 2

Equipment (fans) of category 1 is intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur.

Category 2 comprises equipment designed to be capable of functioning in conformity with the operational parameters established by the manufacturer and of ensuring a high level of protection.

The means of protection related to equipment of Category 2 ensures the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.

Equipment (fans) of Category 2 is suitable for use in zone 1 and 21 (also 2 and 22).

### 3.2.3. Group II, Category 3

Equipment (fans) of Category 3 is intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are unlikely to occur, or, if they do occur, are likely to do so infrequently and for a short period only.

Category 3 comprises equipment designed to be capable of functioning in conformity with the operational parameters established by the manufacturer and of ensuring a normal level of protection.

Equipment of categorie 3 ensures the requisite level of protection during normal operation.

Equipment (fans) of categorie 3 is suitable for use in zone 2 and 22.



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# Important Data

## 1. Flash point

This is the 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.

## 2. Auto-ignition temperature

This is the minimum temperature required to ignite a gas or vapour (air or dust cloud) without a spark or flame being present.

Some examples are shown in the table underneath:

GAS	Flash Point	Auto-ignition Temperature	LEL	UEL
Acetone	- 18 °C	465 °C	2,6 %	12,8 %
Gasoline	- 43 °C	280 °C	1,4 %	7,6 %
Methane	- 188 °C	537 °C	5,0 %	15,0 %
DUST	Ignition Temp. Dust Cloud		Ignition Temp. Dust Layer (5 mm) - Glow Temperature	
Flour	490 °C		340 °C	
Synthetic rubber	450 °C		240 °C	
Zinc	570 °C		440 °C	

Table 3 (indicative, certain substances, e.g. flour, can vary according to type)

For dust, 2 different ignition temperatures need to be controlled: the ignition temperature of a dust cloud and of a dust layer (5mm).

## 3. Lower and upper explosion limit (LEL & UEL)

These are the limits (expressed in volume % of vapour or gas or gr of dust per m<sup>3</sup>) of the «explosion range». This is the range of the concentration of a flammable substance in the air, in which an explosion can occur.

If the value is lower than the LEL, the mixture is too poor.

If the value is higher than the UEL, the mixture is too rich (with other words: there is not enough O<sub>2</sub> present)

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## 4. Temperature class

The temperature class refers to the maximum surface temperature of equipment

Temperature Class	Maximum Surface Temperature
T1	450 °C
T2	300 °C
T3	200 °C
T4	135 °C
T5	100 °C
T6	85 °C

Table 4

The choice of the temperature class of max surface temperature must be defined so that:

### For gas:

- The chosen temperature class must be chosen in relation to the ignition temperature of the gas or vapour
- For fans of category 2, the temperature class may not exceed 80 % of the ignition temperature. For category 3 fans, this is not the case

### For dust:

- The maximum surface temperature shall be equal or lower than the lowest value of:
  - 2/3 of the ignition temperature of a dust cloud
  - Ignition temperature of dust layer – 75 °C
- For dust, one uses the maximum surface temperature as an absolute figure (not temperature class)

## 5. Explosion group

Group II, as defined in Chapter 3 above, is divided into explosion groups.

A, B and C are subdivisions according to the Maximum Experimental Safe Gap (MESG), which shows the maximum dimension of an opening so that it still draws enough energy from a flame of the concerned gas or vapour to put it out.

There is a direct relationship with the ignition energy.

Example: The minimum ignition energy (lowest possible value over the explosion range)

H<sub>2</sub> : 0,01 mJ  
CH<sub>4</sub> : 0,28 mJ

For fans, Almecco doesn't distinguish between IIA and IIB. We do have a separate design for Hydrogen of group IIC.



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# ATEX Fans

## Direct Driven Axial Fans

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# Direct Driven Axial Fans

Almeco builds and sells direct driven axial fans of Category 2 and Category 3. We use the standard EN 14986 "Design of fans working in potentially explosive atmospheres". The conditions and descriptions underneath need to be taken into account. If one or more conditions vary, they must be subject to a study and the technical file must be revised.

## 1. Conditions of use

- Gases of explosion group IIA, IIB and hydrogen (IIC). The other gases of group IIC are excluded
- The atmospheric pressure must be between 0,8 and 1,1 bar
- The temperature (ambient air and conveyed air/gas) must be between - 20 °C and + 60 °C
- The maximum volume fraction of oxygen is 21 %

## 2. Types of fans

### 2.1. AVK: Fan with integrated inlet bell

- Direct driven, impeller fixed on motor shaft
- Diameters: 315 to 1800 mm
- Motors Eexd, Eexe or Eexn
- Use: especially free inlet applications (type A & B installation in accordance with ISO 13349)

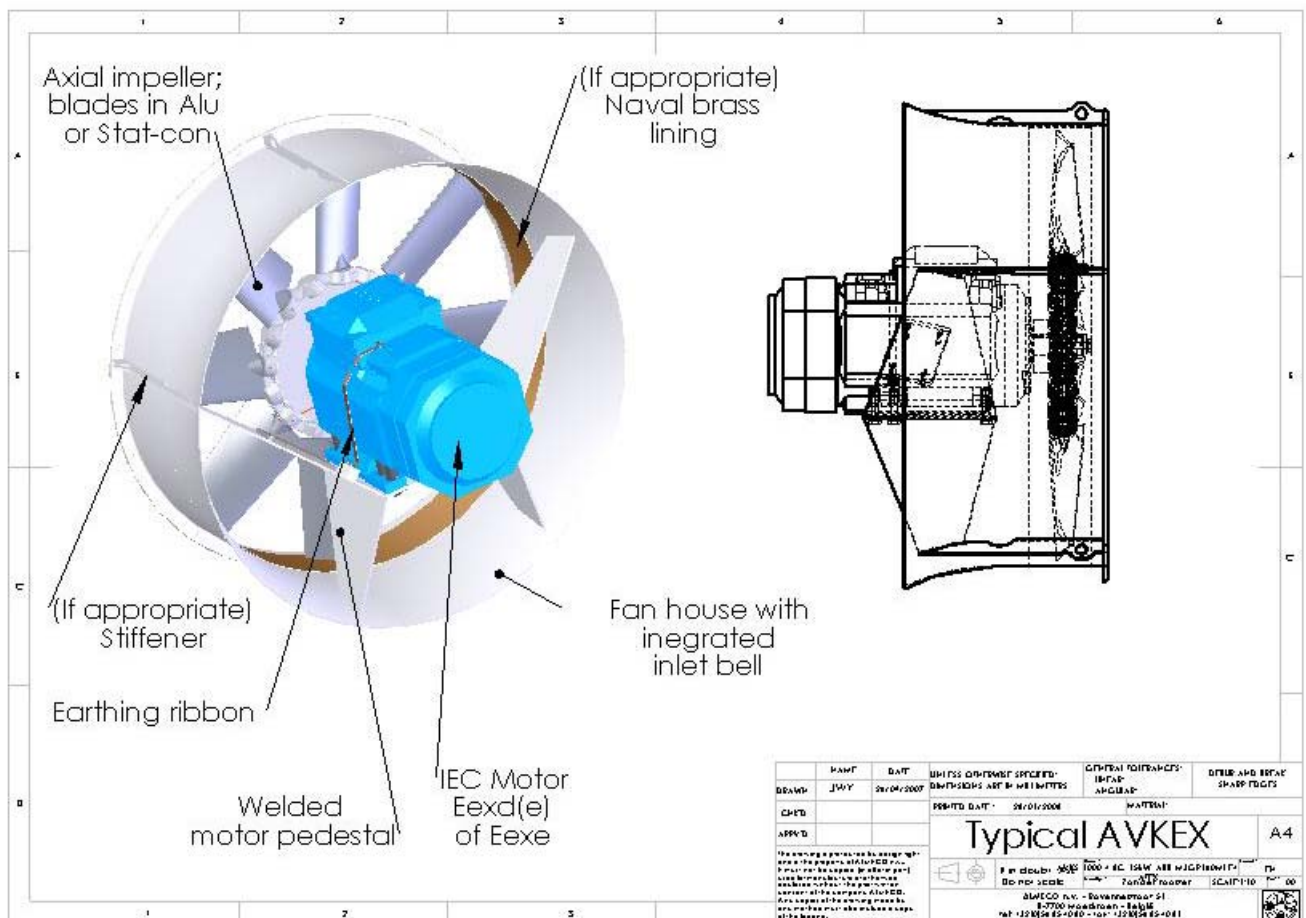


Figure 1

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# Direct Driven Axial Fans

## 2.3. ADL: Long cased

- Direct driven, impeller fixed on motor shaft
- Diameters: 315 to 1800 mm
- Motors Eexd, Eexe or Eexn
- Use: especially connected inlet and outlet applications (type D installation acc. to ISO 13349)

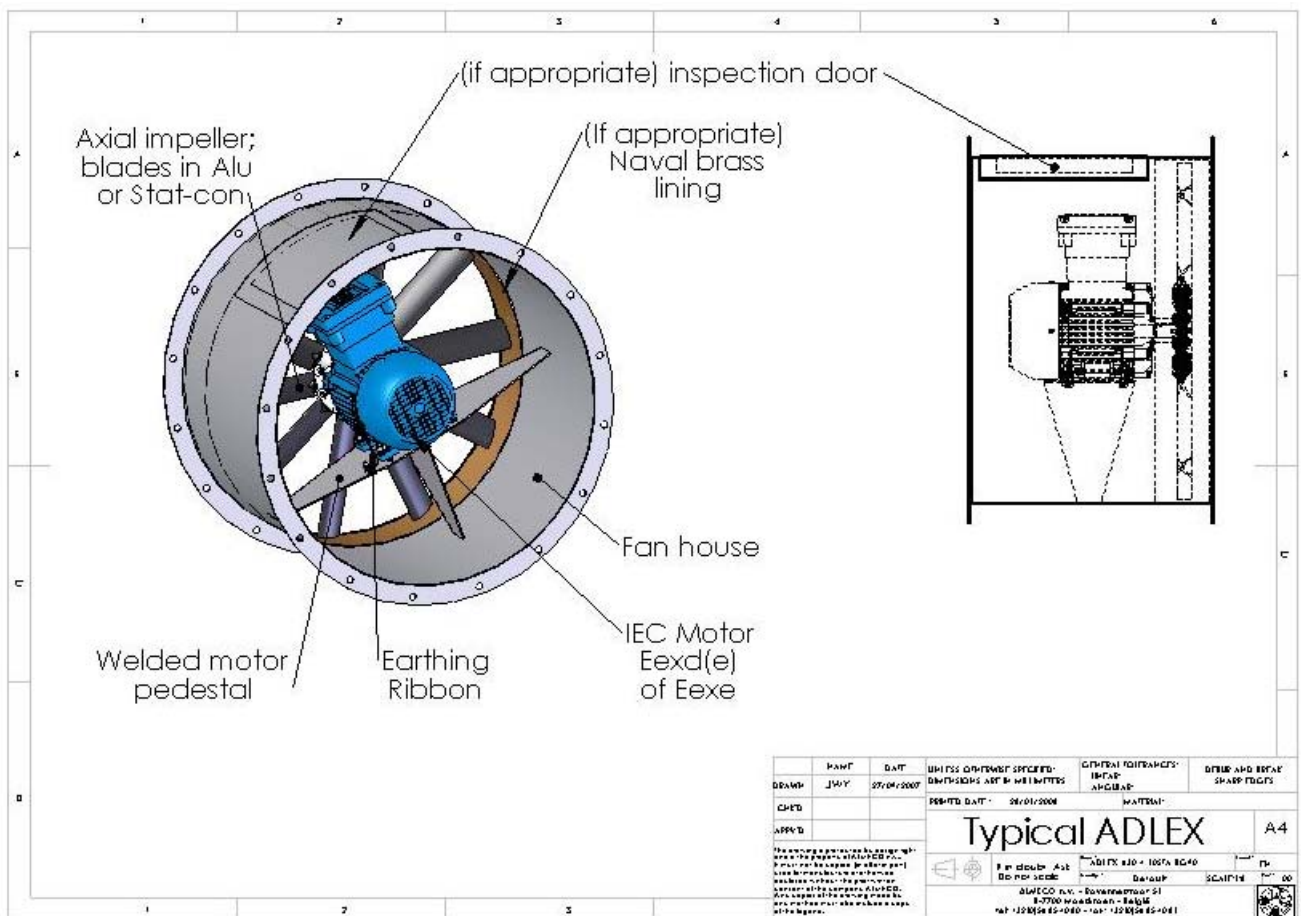


Figure 3

## 3. Fan houses

Fan houses are made of:

- Steel, hot dip galvanised after fabrication
- Steel, hot dip galvanised after fabrication with top coating (Duplex)
- Stainless steel grade 304L or 316L, pickled and passivated

Inlet bells are spinned. Flanges are spinned (fig 4) or laser-cut and welded (fig 5)

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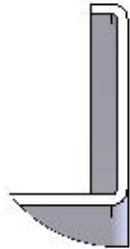


Figure 4

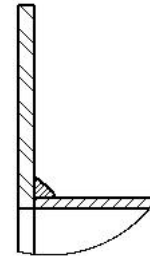


Figure 5

The pedestals for the motors are always welded on the fan house. Only then corrosion protection is applied.



Figure 6



Figure 7

## 4. Impellers

The impellers of Almecco are made with aerofoil blades. For categories 2 & 3 blades are made of cast aluminium or glassreinforced conductant polyamide.

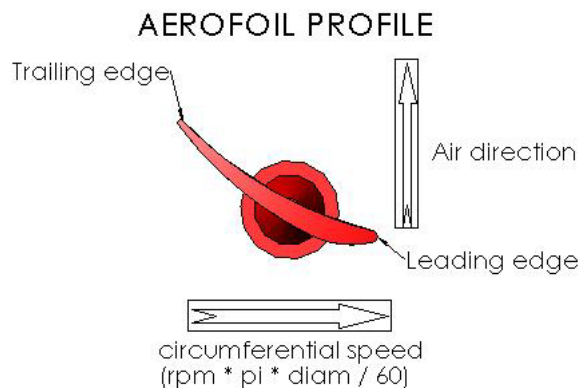


Figure 8

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Figure 9

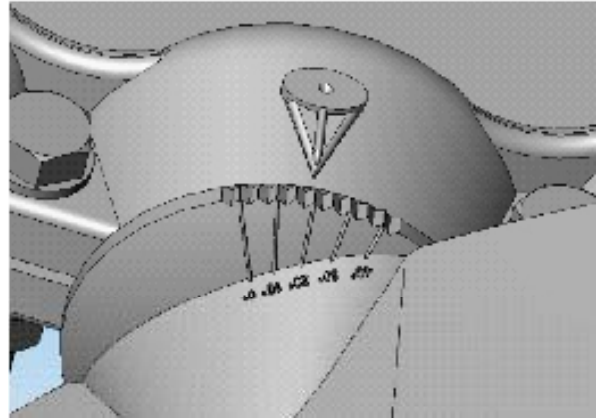


Figure 10

The blade angle can be changed at standstill, which permits an easier adjustment of flow and pressure.

Our impellers are balanced in accordance with Quality class 6.3, ISO 1940. After assembling the complete fan, a vibration measurement is done at full speed (ISO 14694).

## 5. Motors

Different kinds of protection can be applied to motors. In the table underneath, you can find the type of protection you need for the different zones of Group II.

Zone 0 en 20 do not appear in the table. Motors cannot be used in those zones.

Type	Use	Protection	Zones	Group Indication	Temperature Indication	
EExd	II 2 G	Flameproof	1 & 2	IIA, IIB or IIC, indicated seperately	T Class must be indicated	
EExe	II 2 G	Increased Safety	1 & 2	II suffices (no subdivision A, B or C)	T Class must be indicated	Tripping time $t_E$
EExnA	II 3 G	Non-sparking	2	II suffices (no subdivision A, B or C)	T Class must be indicated	
DIP IP 65	II 2 D	Dust ignition proof	21 & 22	Not applicable	T (Absolute) must be indicated	
DIP IP 55	II 3 D	Dust ignition proof	22 (only conductive dust)	Not applicable	T (Absolute) must be indicated	

Table 5

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## 5.1. Flameproof motors EExd

Those motors are designed to stop a flame from spreading:

- In an EExd motor no gaps (flamepaths) can exceed mandatory dimensions. Gases and vapours are sub-divided according to Maximum Experimental Safety Gap (mesg, see above 2.5 Explosion Group). Different Eexd motors exist depending on which gases of group IIA, IIB or IIC are used.
- The motor is physically capable of withstanding an internal explosion without transmitting this to the external atmosphere

Example: II 2G EEx d II B T4

## 5.2. Increased safety motors EExe


This increased safety consists of:

- Protection against excessive temperatures
- Protection against sparks and arcs

Both items above apply for :

- Inner and outer parts of the motor
- Service, start and in case of a locked rotor (stall)

For this last demand, a specified time  $t_e$  is defined. This is the tripping time of a special protection device needed for these motors.

Exemple:  II 2G EEx e II T3

## 5.3. Non sparking motors EExnA

These motors are designed so that no sparks can occur in normal operation and use within the ratings specified by the manufacturer. Thermal requirements due to starting or accidental stalling are excluded (in contrast to Eexe motors).

Example:  II 3G EEx nA II T3

## 5.4. Dust ignition proof motors (DIP)

Those motors are designed so that:

- No potentially explosive atmosphere can penetrate inside the motor. Ingress is prevented by the IP protection (IP 55 of IP 65)
- The maximum surface temperature outside the motor must not exceed the temperature class for which the motor is certified
- No sparks may occur outside the motor enclosure.

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Most manufacturers of DIP motors certify their motors for 125 °C; 2 types exist:



II 2D T125°C IP 65

- Must be used for zone 21
- Must be used for zone 22 is the dust is conductive.
- May be used for zone 22 is the dust is non-conductive



II 3D T125°C IP 55

- Must be used for zone 22, only when the dust is non conductive

## 6. Material pairings

In view of possible friction, which can be expected due to malfunctions (or even rare malfunctions), potential areas of contact between rotating elements and fixed components are manufactured from materials in which the risk of ignition through friction and friction-impact sparks, hot spots of hot surfaces is minimised.

Almeco can build its axial fans AVK, ADK & ADL with the following combinations:

Impeller (Blades)	Fan house	Remarks
<b>For IIA &amp; IIB</b>		
Cast aluminium	Naval brass	Brass is put as a lining inside the steel house
Plastic	Naval brass	Brass is put as a lining inside the steel house
Plastic	Steel or cast iron	
Plastic	Stainless steel	Only austenitic StSt
<b>For Hydrogen (IIC)</b>		
Plastic	Steel	
Cast aluminium	Naval brass	Brass is put as a lining inside the steel house

Table 6

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If a brass lining is appropriate, it is fixed to the steel housing with a hydraulic stamp and die presser, which results in a solid connection, which reduces damage of the corrosion protection to a minimum.

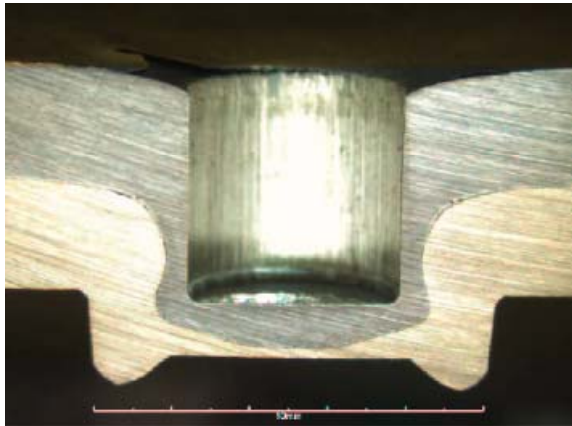


Figure 11



Figure 12

## 7. Speed regulation

Almeco ATEX fans can be regulated in speed by a frequency inverter. This regulation however has its conditions and limits:

- Almeco must be informed about the speed control at the moment of order (see ATEX form underneath)
- In all cases temperature control of the windings (PTC) must be integrated in the circuit
- In some cases a combination of motor and drive of the same make are obliged
- Speed regulation of Increased safety motors EExe is very complicated and therefore not recommended
- Maximum speeds are to be defined to ensure motorpower and maximum impeller speed is not exceeded
- Nominal motor torque (and thus power) is lower

### Notes:

Almeco does not support any other method of regulation for its ATEX fans. Especially regulation by throttling is out of the question.

## 8. Other voltage supplies

ATEX fans with other supplies (440 V – 60Hz, 480 V –60 Hz, 400 V – 60 Hz, ...) can be supplied. This is however very often accompanied with a longer lead time.

- UL-listed Ex motors can be supplied. The American system (classes and divisions and groups) however does not overlap with the European system in an obvious way (groups and categories). Consequently Almeco can not write its standard CE declaration of conformity
- US “spark resistant construction”, AMCA 99-0401-086 is up to now not supported by our ATEX fans
- In some cases ATEX fans are accepted in the US
- In most cases ATEX fans are accepted in the Middle East



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# ATEX Fans

## Documents

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## 2. CE Declaration of Conformity




### VERKLARING VAN OVEREENSTEMMING

Volgens Artikel 8, punt 3 van de richtlijn 94/9/EG

Moeskroen, 11/02/2008

Stefaan De Clercq, gevolmachtigde van ALMECO NV,  
verklaart dat volgende ventilator

Fabrikaat	:	AAA
Vertegenwoordigd door	:	ALMECO NV
Beschrijving	:	Rechtstreeks gedreven axiaalventilator
Type	:	ADKEX 400/2/5B/10°
Fabrikatienummer	:	1 stuk: A071021
Categorie	:	 II 2 G
Gebruiksaanwijzing	:	GBRKNLAXICAT2.01

Voldoet aan de algemene veiligheids- en gezondheidseisen volgens bijlage II van de richtlijn 94/9/EG,

voldoet aan de bepalingen van de volgende andere richtlijnen :

98/37/EG, 73/23/EG en 89/336/EG

en verklaart voorts dat de volgende (onderdelen van) geharmoniseerde normen zijn toegepast :

EN 14986, 13463-1, 13463-5, EN 292-1, EN 292-2, EN 294.

Toe te passen geharmoniseerde EG-standaarden: EN 292-1, EN 292-2, EN 294,  
EN 1127-1, EN 13463-1, EN 13463-5, EN 14986

Ondergetekende, De Clercq Stefaan, gevolmachtigde, gemandateerd door de Fabrikant, verklaart dat de hierboven beschreven ventilator enkel in gebruik mag genomen worden als hij ingebouwd is volgens de bijhorende gebruiksaanwijzing en volgens de richtlijn "MACHINES" 98/37/EG en de richtlijn "ATEX" 94/9/EG hierboven vermeld. Tevens moet de betrokken machine in overeenstemming met de bepalingen van deze richtlijnen worden verklaard door haar fabrikant.

De Clercq Stefaan  
i.o. Trappeniers Andy  
N.V. ALMECO

ALMECO n.v.

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## 5. Confirmation notified body for Cat. 2 fans



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Essais - Expertises

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**e-mail :**  
direction@issep.be  
**site web :**  
http://www.issep.be

- (1) **ACCUSE DE RECEPTION**
- (2) **Appareil ou système de protection destiné à être utilisé  
en atmosphères explosibles  
Directive 94/9/CE**
- (3) Numéro de l'accusé de réception : **ISSeP08ATEX001**
- (4) Appareil : Ventilateurs axiaux à entraînement direct
- (5) Demandeur – Fabricant :  
ALMECO N.V. / S.A.
- (6) Adresse: Rue de la Royenne 51  
7700 Mouscron
- (7) Objet :  
Réception d'un dossier technique concernant les ventilateurs axiaux à entraînement direct  
conformément à la procédure prévue par la directive ATEX 94/9/CE.
- (8) Rapport :  
Nous accusons réception de votre dossier technique suivant la procédure définie à l'article 8,  
alinéa b, sous alinéa ii) de la directive ATEX 94/9/CE.  
La demande d'archivage du dossier est datée du 20 décembre 2007
- (9) Remarque :  
Sur base de la fiche de clarification, décision ExNB/99/086/CS du groupe des Organismes notifiés  
européens ATEX, le dossier ne doit faire ni l'objet d'une approbation de l'état complet ni même  
d'un contrôle de l'exactitude.
- (10) Conclusion :  
Nous nous limitons dès lors à en accuser la réception.

Colfontaine, le 07.01. 2008

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M. LAMBERT,  
Directeur.

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RÉGION WALLONNE



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# ATEX Fans

## Strengths Almeco

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# Strengths Almecco

## 1. Own design

- Technical knowledge in-house
- Fast answer on special requirements
- Accurate answer to customer demands
- ...

## 2. Large stock

- Parts are kept in stock in accordance with customer's habits
- Ability to cope with emergency and last-minute demands
- In many cases spare parts have no lead time
- Packing as to customer's requirements

## 3. Engineering and software

- Experienced engineers for design
- Experienced engineers for selections and offers
- Up-to-date 3D modeling software (Solid Works)
- Up-to-date FEA (Finite Elements Analysis - Cosmos)
- All necessary measuring instruments (vibration, noise, ...)
- ...

## 4. Co-operation and ERP

- Close communication between sales and engineering
- ERP (Enterprise Resource Planning) helps from enquiry up to delivery and after sales

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