ATEX Certified Fans
for Gas Group IIC: Hydrogen

A wide range of ATEX compliant fans suitable for Gas Group IIC to ensure the adequate and safe removal of Hydrogen gas.

AXAIR
FANS UK LIMITED

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Understanding Hydrogen

Hydrogen is a gas group IIC gas and belongs to the T1 temperature class making it one of the hottest, most dangerous gases. When mixed with oxygen, Hydrogen is a highly explosive substance that is odourless, colourless and lighter than air.

Battery Room Ventilation

The lightweight element accumulates above the oxygen, and where effective ventilation is not in place, a build-up can occur. In extreme circumstances there have been cases of battery room explosions as a result of ineffective battery room ventilation. A small smoulder can create a huge explosion when hydrogen is in the presence of oxygen, and besides this, hydrogen is hazardous to health, causing skin burns and eye issues.

Everyone knows the function of a battery; to store electricity in the form of chemical energy and to convert to electrical energy when required. Vented lead-acid batteries or flooded batteries as they are also commonly known, consist of plates that are flooded with an acid electrolyte. When charging, the electrolyte emits hydrogen through the vents in the battery. Under normal operations, the release of hydrogen is relatively small, but this is elevated during heavy recharge periods. It's an important consideration for battery room ventilation, in renewable energy storage and carrier technologies as hydrogen will be a key factor in ensuring a reliable, safe, and stable energy source in the post fossil fuel period. Therefore, the safety of hydrogen ventilation and a correct hazardous area classification should always be undertaken when handling applications that have this explosive group IIC gas.

Hazardous Area Class

HAC's or hazardous area classifications are used to identify places where, because of the potential for explosive atmospheres, special precautions over sources of ignition are needed to prevent explosions. Hazardous area classifications should only be done by responsible and certified personal; equipment manufacturers should not decide the classification and the onus should be on the end user to determine the correct zone and class of the area to determine where an explosive atmosphere is present, if it may occasionally occur or if it will only exist in abnormal conditions.

Gas Group IIC Certified

Our entire range of ATEX certified fans are suitable for Gas Group IIC or IIB + hydrogen applications for effective hydrogen exhaust. Our industrial team can assist in providing an ATEX quote to your specified gas and dust zone. Email sales@axair-fans.co.uk or call 01782 349 430.

FMA FAN MANUFACTURERS ASSOCIATION

nqa ISO 9001 QUALITY MANAGEMENT UKAS MANAGEMENT SYSTEMS 015

SMOKE CONTROL ASSOCIATION

A CarbonZero Company

Wind to Hydrogen Generation

A substantial proportion of offshore wind farms could eventually make Hydrogen rather than transmit electricity. Hydrogen exhaust will be a key factor in designing these emerging renewable electrolysis technologies.

Offshore Electrolysis

Although the most common element in the universe, Hydrogen isn't found in its purest form and must be either electrolysed from water or stripped out of natural gas. Both are energy intensive processes that result in greenhouse gas emissions. Using electricity in a process called electrolysis can split water into hydrogen and oxygen. By combinng wind turbines to hydrogen production there is a synergy that reduces the drawbacks of electrolysis.

For wind to hydrogen generation, these systems work by linking wind turbines to electrolysers which pass the wind generated electricity through water to split the liquid into hydrogen and oxygen. The hydrogen can then be stored and used later to generate electricity. The only by-product of producing hydrogen is water.

Current developments are allowing researchers to compare different type of electrolysers and work on increasing the efficiency of wind to hydrogen systems. The technology has the potential to deliver a completely emission free, climate-friendly method of making, storing and using energy in the future.

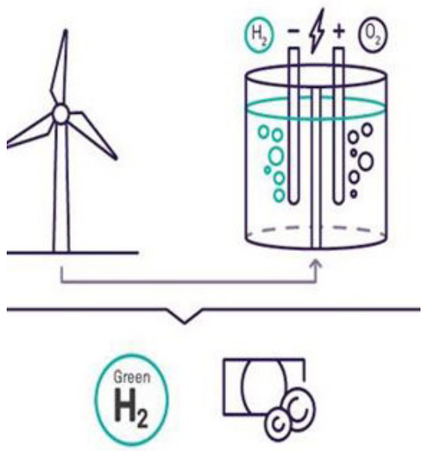
As wind turbines are placed further out to sea, hydrogen production close to source is now even more attractive.

"The Global demand for Hydrogen is 75 million tonnes & is likely to rise sharply."

Green Hydrogen

Green hydrogen is created when hydrogen is generated without any greenhouse gas emissions. If the electrolysers that split water into hydrogen and oxygen are powered by renewable sources. Today, the world produces 75 million tonnes of hydrogen each year, most of it generated from fossil fuels, mainly natural gas and coal resulting in 830 million tonnes of carbon dioxide being released each year. Producing hydrogen with green energy will substantially reduce emissions.

Green hydrogen starts with wind. Lots of wind. Harvesting wind offshore on a massive scale can produce stable green hydrogen on a large scale and quickly.



Fan Integration Experts

Any structure containing hydrogen components should be adequately ventilated. The lightweight element can accumulate above oxygen causing a build up and in extreme circumstances explosions can occur. We're here to help when you need us.

"Our application knowledge covers a vast range of renewable technology systems including those designed and built around our fans in sources such as wind farms."

As fan integration experts we recieve a lot of enquiries around hydrogen exhaust for gas group IIC or IIB + hydrogen. In many instances it is necessary to integrate an ATEX fan whilst in some systems we can advise of methods of integrating an alternative fan and avoiding the requirement for ATEX certified industrial fan components.

Our application knowledge covers a vast range of renewable technology systems including those of renewable energy generation such as wind farms. You can trust that we'll supply the right industrial fan for your requirements.

All of our ATEX certified fans are suitable for IIC gas groups for the safe and effective removal of hydrogen gas.

Contact our technical team on sales@axair-fans.co.uk to discuss your project in depth. We'll advise on possible fan integration options and where needed can refer you to an independent consultant to assess ATEX zones and classes.

Explosion Groups & Temperature

The explosion group determines the explosive level of the gas while the temperature determines the highest acceptable surface temperature on the motor. If the temperature on the surface of the motor exceeds this level, ignition of the gas is possible.

Explosion Group	Temperature Class / Maximum Surface Temperature Allowed					
Ignition Temp	T1	T2	T3	T4	T5	T6
	>450°	>300°	>200°	>135°	>100°	>85°
I	Methane	l-amyl acetate	Amyl alcohol	Acetaldehyde		
IIA Ignition energy higher than 0.18mJ	Acetone	n-butane	Petrols			
	Ammonia	n-butanol	Diesel Oils			
	Benzene	1-butene	Heating Oils			
	Ethylacetate	Propylacetate	n-hexane			
	Methane	l-propanol				
	Methanol	Vinyl Chloride				
	Propane					
	Toluene					
IIB Ignition energy lower than 0.18mJ	Cyanide Hydrogen	Butadleno	Dimethylether	Diethylether		
	Dioxane	Ethyloglicol				
	Coal Gas (lighting gas)	Ethylene Oxide	Sulfide Hydrogen			
IIC Ignition energy lower than 0.18mJ	Hydrogen	Acetylene				Carbon Disulphur

Important Information Regarding ATEX Fan Selection

The Axair team have undertaken extensive training in ATEX regulations but have a duty of care to ensure we supply a suitable fan based upon a customer's correct ATEX coding specifications. Therefore explosion group and the temperature should be advised before a fan is selected. ATEX has to be understood as an ever evolving subject requiring competence and training that is now provided by UK notified bodies and consultancies. We advise that if anyone requires additional training in ATEX that they contact an independent body for assistance. Axair can supply fans suitable for ATEX applications within zone 1 & 2 for Gas and Zone 22 for Dust, manufactured from either metal or corrosion resistant polypropylene depending on the specification.

ATEX Fans: IIC Hydrogen

A wide range of ATEX compliant fans suitable for Gas Group IIC to ensure the adequate and safe removal of Hydrogen gas. Our entire range of ATEX certified fans are suitable for Gas Group IIC.

Ventilation should ideally be placed at both high points (for the exhaust of hydrogen that accumulates above the oxygen), and low points within the room to encourage forced ventilation out of the room. There should be no air recirculation under any circumstances as this encourages the mix of the two gases, where possible on a seperate ventilation system than the rest of the building.

Axial & Roof Fans

HBX Ex ec IIC T3
HBX Ex eb IIC T4

HBX Ex ec IIC T3
HBX Ex eb IIC T4

HBX Ex db IIC T5

HMX Ex ec IIC T3
HBX Ex eb IIC T4

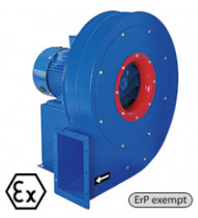
CTH3-A Ex ec IIC T3
CTH3-A Ex db IIC T5

Please note: ATEX Certified fans for potentially explosive atmospheres are manufactured and tested according to legal regulations in the EU, Internationally and in the UK. Quoted ATEX fans all have conformance documents for review.

Centrifugal Fans

AAVA Ex ec IIC T3

AAVC Ex ec IIC T3



AAVG/N Ex ec IIC T3

AAVM/N Ex ec IIC T3

AAVP Ex ec IIC T3

AAX Ex ec IIC T3

AAZA Ex ec IIC T3

MAX Ex ec IIC T3
MAX Ex db IIC T4

MBCA Ex ec IIC T3
MBCA Ex eb IIC T4

MBGR Ex ec IIC T3

MBRM Ex ec IIC T3

MBRU Ex ec IIC T3

MBX Ex ec IIC T3
MBX Ex db IIC T4/T5

MBZM P/R Ex ec IIC T3

NIMAX Ex ec IIC T3

NIMUS Ex ec IIC T3

Please note: Equipment manufacturers and distributors are not ATEX consultants, cannot play any role in the process of determining the risk of explosion and cannot therefore specify the ATEX 2014/34/EU code for any product supplied.

Directive, Coding & Motors

The following brief notes are provided for guidance purposes and must not be considered to form part of any contract for supply of equipment or accessories.

ATEX User & Manufacturer Directives

99/92/EC ATEX 137 (formerly 118a), often referred to as “The Users Directive” is concerned with safe working conditions and is implemented in UK law by the Health & Safety Executive in the form of the Dangerous Substances and Explosive Atmospheres regulation, or DSEAR.

“ATEX 137 requires the end user to define what the equipment manufacturer can lawfully supply”

94/9/EC ATEX 95 (formerly 100a), often referred to as “The Manufacturers Directive” is concerned with ATEX product compliance. The legislation enables the equipment manufacturer to supply product that meets or exceed the minimum requirements of the end users DSEAR risk assessment.

“ATEX 95 requires the equipment manufacturer to supply safe and lawfully suitable products”

ATEX Motors

The type of flameproof motor depends on the duration of the risk of explosion - generally identifed by an Equipment Category number. Non Incendive motors are designbed to avoid internal contact sparking, increased safety motors are a non-incendive type with thermistors to limit the shell temperature while Explosion proof motors will contain an internal explosion and prevent the flame from escaping.

To Recap:

Ex d is Cat.2 flameproof i.e not sparking but a spark induced internal flame cannot escape from the motor.

Ex nA is Cat.3 non-incendive i.e anti-sparking in normal operation, but not flame proof.

Electric motors are susceptible to over-heating when running on overload, when their supply or self cooling air is reduced, when the ambient air is too high, or when part of the motor surface is thermally insulated by its installed situation. Any one of these conditions could lead to an explosion.

All speed controlled ATEX motors recieve less cooling air on speed reduction and must therefore be supplied with thermistor over-temperature sensors to protect against shell temperature in excess of the motor temperature class.

Manufacturers generally select the type of motor required to meet the regulations, clients sometimes choose to over specify the motor for extra security.

ATEX Fans

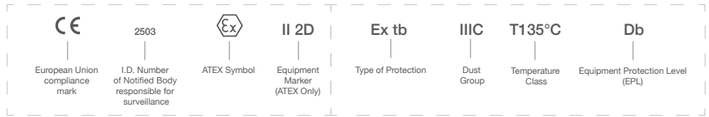
In addition to their ATEX coding, ATEX fans must be selected with reasonably good knowledge of their flow rate or pressure operating point; the temperature and fume content of the air to be transported; especially whether hydrogen or acetylene fumes are present; whether they are being installed indoors or outdoors; the voltage of the anti-condensation heaters (if specified) and which handing is required in the case of centrifugal fans.

Hazardous Area Guide

It is strictly the responsibility of the end user to perform a DSEAR risk assessment to ensure that flameproof zones are properly defined in terms recognised by ATEX 99/92/EC. The below guide is intended for guidance only.

Typical Equipment Marking for Gas Atmospheres

Typical Equipment Marking for Dust Atmospheres



Gas Zones

Gas Zones	Definition	ATEX Category	EPL	Required Protection
Methane	Mines with methane and dust. Equipment remains energised in explosive atmosphere	M1	Ma	Two Faults
Methane	Mines with methane and dust. Equipment is de-energised in explosive atmosphere	M2	Mb	Severe Normal Operation
Zone 0	Explosive atmosphere present continuously or for long periods, frequently	1G	Ga	Two Faults
Zone 1	Explosive atmosphere is likely to occur under normal conditions, occasionally	2G	Gb	One Fault
Zone 2	Explosive atmosphere is unlikely to occur under normal conditions, short periods	3G	Gc	Normal Operation

Dust Zones

Dust Zones	Definition	ATEX Category	EPL	Required Protection
Zone 20	Explosive atmosphere present continuously or for long periods, frequently	1D	Da	Two Faults
Zone 21	Explosive atmosphere is likely to occur under normal conditions, occasionally	2D	Db	One Fault
Zone 22	Explosive atmosphere is unlikely to occur under normal conditions, short periods	3D	Dc	Normal Operation

Enclosure Ingress Protection (IP) Level

Enclosure Ingress Protection (IP) Level: To EN/IEC 60529	
First Number (Solid objects / dust)	**Second Number (Water)**
0 No protection	0 No protection
1 Objects > Ø50 mm	1 Vertically dripping water
2 Objects > Ø12.5 mm	2 Vertically dripping water with enclosure tilted by 15°
3 Objects > Ø2.5 mm	3 Sprayed water up to 60° from the vertical
4 Objects > Ø1.0 mm	4 Sprayed water from all directions
5 Dust protected	5 Water jets
6 Dust tight	6 Powered water jets
-	7 Temporary submersion < 1m depth
-	8 Extended submersion > 1m depth

Ambient Temperature Range (T amb)

Tamb =	Temperature relating to the immediate surroundings of the equipment (assumed to be -20°C to +40°C, unless stated

Protection Concept - Electrical - Gas

Type of Protection (electrical - gas)	Reference
General Requirements	EN/IEC 60079-0
Flameproof - Ex d / da / db / dc	EN/IEC 60079-1
Purge/Pressurised - Ex p / pxb / pyb / pzc	IEC 60079-2
Quartz/Sand Filled - Ex q / qb / qc	EN/IEC 60079-5
Oil Immersion - Ex o / ob / oc	EN/IEC 60079-6
Increased Safety - Ex e / eb / ec	EN/IEC 60079-7
Intrinsic Safety - Ex i / ia / ib / ic	EN/IEC 60079-11
Non Sparking - Ex nA / nC / nL	EN/IEC 60079-15
Encapsulation - Ex m / ma / mb / mc	EN/IEC 60079-18
Optical Radiation - Ex op is / op sh / op pr	EN/IEC 60079-28
Trace Heating Systems - Ex e / Ex 60079-30-1	EN/IEC 60079-30-1
Special Protection Ex s	EN/IEC 60079-33
Caplights	EN/IEC 60079-35-1
Controlled Spark Duration Power-i	TS 60079-39
Process Sealing	TS 60079-40
Flame Arresters	EN 16852
Diesel Engines	EN 1834-1,2,3

Protection Concept - Electrical - Dust

Type of Protection (electrical - dust)	Reference
General Requirements	EN/IEC 60079-0
Enclosure - ta / tb / tc	EN/IEC 60079-31
Purge/Pressurised - Ex p / pxb / pyb / pzc	EN/IEC 60079-2
Intrinsic Safety - Ex i / ia / ib / ic	EN/IEC 60079-11
Encapsulation - Ex m / ma / mb / mc	EN/IEC 60079-18

Protection Concept - Non Electrical

Type of Protection (non-electrical) (gas & dust)	Reference (ATEX only)	IECEx
General Requirements	EN 80079-36	IEC / ISO 80079-36
Flow Restricting Enclosure - fr	EN 13463-2	-
Flameproof - d	EN 13463-3	-
Constructional Safety - c / h	EN 80079-37	IEC / ISO 80079-37
Control of Ignition - b / h	EN 80079-37	IEC / ISO 80079-37
Pressurisation - p	EN 60079-2	-
Liquid Immersion - k / h	EN 80079-37	IEC / ISO 80079-37

ATEX Gas & Dust Zones

If an explosive atmosphere of flammable substances is specified, the following zones may exist:

ATEX Category	ATEX Zone (Gas & Vapour)	ATEX Zone (Dust)	Presence	ATEX Description
Category 2	Zone 1	Zone 21*	Present Intermittently	An explosive mixture may be present occasionally in normal operation
Category 3	Zone 2	Zone 22*	Present Abnormally	An explosive mixture is not expected to be present in normal operation or will only be present for a short time

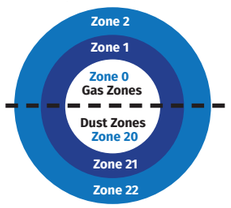
Zone 22 dust fans available on request

Suitable for Zone 0, 1 & 2
ATEX Group & Category: II 1G
IECEx Equipment Protection Level: Ga
Types of protection (electrical): ia, da, ma, op is
Types of protection (non-electrical, ATEX): c, b, k
Types of protection (non-electrical, IECEx): h

Suitable for Zone 1 & 2
ATEX Group & Category: II 2G
IECEx Equipment Protection Level: Gb
Types of protection (electrical): db, eb, ib, mb, ob, pxb, pyb, qb, op is, op pr, op sh
Types of protection (non-electrical, ATEX): d, c, b, p, k, h
Types of protection (non-electrical, IECEx): d, p, h

Suitable for Zone 2 only
ATEX Group & Category: II 3G
IECEx Equipment Protection Level: Gc
Types of protection (electrical): dc, ec, ic, mc, nA, nC, nR, oc, pzc, qc
Types of protection (non-electrical, ATEX): fr, d, c, b, p, k, h
Types of protection (non-electrical, IECEx): fr, d, p, h

Zones of Use
Explosive Atmospheres



Suitable for Zone 20, 21 & 22:
ATEX Group & Category: II 1D
IECEx Equipment Protection Level: Da
Types of protection (electrical): ta, ia
Types of protection (non-electrical, ATEX): c, b, k, h
Types of protection (non-electrical, IECEx): fr, d, p, h

Suitable for Zone 21 & 22:
ATEX Group & Category: II 2D
IECEx Equipment Protection Level: Db
Types of protection (electrical): tb, ib, mb
Types of protection (non-electrical, ATEX): d, c, b, p, k, h
Types of protection (non-electrical, IECEx): d, h

Suitable for Zone 22 only:
ATEX Group & Category: II 3D
IECEx Equipment Protection Level: Dc
Types of protection (electrical): tc, ic, mc
Types of protection (non-electrical, ATEX): fr, d, c, b, p, k, h
Types of protection (non-electrical, IECEx): h

Gas Groups

Gas Groups	Gases are classified according to the ignitability of the gas/air mixture as defined in EN/IEC 60079-20-1
IIA	Acetic Acid, Acetone, Ammonia, Butane, Cyclohexane, Propane, Gasoline (petrol), Methane (natural gas, non-mining), Toluene, Xylene. Methanol (methyl alcohol), Propane-2-ol (iso-propyl alcohol)
IIB	Group IIA gases plus, Di-ethyl ether, Ethylene, Ethanol Methyl ethyl ketone (MEK), Propane-1-ol (n-propyl alcohol)
IIC	Group IIA and IIB gases plus, Acetylene, Hydrogen

Dust Groups

Dust Groups	Dusts are classified by the types of material that make up the dust
IIIA	Combustible Fibres and Flyings
IIIB	Group IIIA dusts plus, Non-Conductive Dusts
IIIC	Group IIIA and IIIB dusts plus, Conductive Dusts

Equipment Group

Equipment Group	Definition
Group I	Electrical equipment intended for use in mines susceptible to fire damp
Group II	Electrical equipment intended for use in explosive gas atmospheres
Group III	Electrical equipment intended for use in explosive dust atmospheres

Temperature Class (T Class)

Temperature Class (T Class)	Highest temperature achieved under the most adverse equipment rating and heating conditions. (Flashpoint temperature of some gases)
T1: 450°C	Ammonia (630°C), Hydrogen (560°C), Methane (537°C), Propane (470°C)
T2: 300°C	Ethylene (425°C), Butane (372°C), Acetylene (305°C)
T3: 200°C	Cyclohexane (259°C), Kerosene (210°C)
T4: 135°C	Di-ethyl Ether (160°C)
T5: 100°C	-
T6: 85°C	Carbon Disulphate (95°C)

AXAIR
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Contact Us

Whatever your issue, concern or question, contact our industrial team using the below contact details. Alternatively, visit our website and open a live chat to start discussions.

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