



Basics of Explosion Protection

As one of the worlds leading manufacturers of loudspeakers for hazardous areas, DNH possess a vast knowledge of explosion-proof technology and gas protection. Below is a short review of basic explosion proof protection, and for further questions, do not hesitate to contact your local DNH distributor or sales office.

Flammable gases, mist and dust, together with Oxygen, form explosive atmospheres. If such an atmosphere is ignited, it will result in an explosion, which can in turn cause serious damage to personnel and equipment.

An explosion can only take place if the following factors are in place simultaneously:

- Flammable substance (gas, vapor, mist or dust) in a suitable distribution and concentration
- Oxygen
- Ignition source

An explosion atmosphere only occurs if the substance to air ratio lies within a certain range, the explosion limits. The explosion limits depend on the ambient pressure and the oxygen concentration of the air.

Explosion Protection

In order to avoid explosions and associated hazards, an operator must incorporate effective anti-explosion measures into their plant/operating area.

The principle of integrated explosion requires that explosion protection measures are taken in the following order:

- Measures to prevent formation of a dangerous explosive atmosphere.
- Measures which prevent dangerous explosive atmospheres from igniting.
- Measures to restrict the effects of a possible explosion to a safe level

These principles in turn have appropriate actions to be taken:

- Primary explosion protection, meaning all measures which prevent the formation of an explosive atmosphere.
- Secondary explosion protection, meaning all measures which restrict the effects of an explosion to an insignificant level
- Explosion resistant protection, meaning all measures taken to reduce the effects of an explosion to an insignificant minimum.

Classification of Zones

Hazardous areas are classified into Zones, depending on the composition and presence of an explosive atmosphere. This enables both selection of suitable equipment and appropriate electrical installation. Electrical apparatus for use in hazardous areas are divided into various categories. The additional character G for gas or D for dust specifies whether the electrical apparatus may be installed in gas and dust endangered areas.



Zones according to EC directive 991921EG:

Zone 0: Continuous presence of explosive atmospheres, device requires very high level of protection.

Zone 1: Occasional presence of explosive atmospheres, device requires high level of protection.

Zone 2: Infrequent presence of explosive atmospheres, device requires normal level of protection.

DNH makes speakers classified for both Zone 1 and 2 (visit DNH Loudspeakers Norway or <http://www.morrisonssav.com/featuredproducts/dnhloudspeakers/dnhproducts/> for further details)

IP Ratings Explained:

IP is short for International Protection, also interpreted as Ingress Protection Rating, and is defined by international standard IEC 60529.

It classifies the degree of protection provided against the intrusion of liquids, solid objects, dust, accidental contact, and water in electrical enclosures.

The two digits indicate conformity with the conditions summarized in the tables below. Where there is no protection rating with regard to one of the criteria, the digit is replaced with the letter **X**. The first digit represents the protection against solid objects and dust, while the second digit represents the protection against water and other liquids.

First digit:

Level	Object size protected against	Effective against
0	—	No protection against contact and ingress of objects
1	>50 mm	Any large surface of the body, such as the back of a hand, but no protection against deliberate contact with a body part
2	>12,5 mm	Fingers or similar objects
3	>2,5 mm	Tools, thick wires, etc.
4	>1 mm	Most wires, screws, etc.
5	Dust protected	Ingress of dust is not entirely prevented, but it must not enter in sufficient quantity to interfere with the satisfactory operation of the equipment; complete protection against contact
6	Dust tight	No ingress of dust; complete protection against contact



Second digit

Protection of the equipment inside the enclosure against harmful ingress of water.

Level Protected against	Details
0 not protected	—
1 dripping water	Dripping water (vertically falling drops) shall have no harmful effect.
2 dripping water when tilted up to 15°	Vertically dripping water shall have no harmful effect when the enclosure is tilted at an angle up to 15° from its normal position.
3 spraying water	Water falling as a spray at any angle up to 60° from the vertical shall have no harmful effect.
4 splashing water	Water splashing against the enclosure from any direction shall have no harmful effect.
5 water jets	Water projected by a nozzle against enclosure from any direction shall have no harmful effects.
6 powerful water jets (wave proof)	Water projected in powerful jets against the enclosure from any direction shall have no harmful effects.
7 immersion up to 1 m (soak proof)	Ingress of water in harmful quantity shall not be possible when the enclosure is immersed in water under defined conditions of pressure and time (up to 1 m of submersion).
8 immersion beyond 1 m (dive proof)	The equipment is suitable for continuous immersion in water under conditions which shall be specified by the manufacturer. NOTE: Normally, this will mean that the equipment is hermetically sealed. However, with certain types of equipment, it can mean that water can enter but only in such a manner that produces no harmful effects.

DNH produces loudspeakers for outdoor use with IP ratings up to 67. If you have any questions regarding IP rating, do not hesitate to contact us.



Temperature Classes

Ignition temperature is the lowest temperature of a surface at which an explosive atmosphere can ignite. Flammable vapors and gases can be classified into temperature classes according to their ignition temperature. Temperature classes are according to IEC/EN NEC 505-10.

T1	Ignition temperature more than 450° Celsius
T2	Ignition temperature between 300 and 450° Celsius
T3	Ignition temperature between 200 and 300° Celsius
T4	Ignition temperature between 135 and 200° Celsius
T5	Ignition temperature between 100 and 135° Celsius
T6	Ignition temperature between 85 and 100° Celsius

The maximum surface temperature of the equipment must always be lower than the ignition temperature of the gas-air or vapor-air mixture in which it is situated.

Explosion Groups:

Explosion protected electrical equipment is divided into 2 groups, group I for mining equipment and group II for equipment used in all other hazardous areas. Electrical equipment belonging to group II are further subdivided in groups IIA, IIB and IIC according to the danger level of the gas or vapor atmosphere in which they are operated. Equipment classified as IIC is suitable for use in more dangerous atmospheres, while the highest protection is required for gas group II (no suffix).

Gas group	Temperature Class					
	T1	T2	T3	T4	T5	T6
I	Methane					
IIA	Acetone	Ethane	Ethyl alcohol	Gasoline	Acetaldehyde	
	Ethyl Acetate		I-amyl acetate	Diesel	Ethyl ether	
	Ammonia		n-butane	Aviation fuel		
	Benzene		n-butyl alcohol	n-hexane		
	Acetic Acid					
	Carbon monoxide					
	Methane					
	Methanol					
	Propane					
	Toluene					
IIB	Iown gas					
IIC	Hydrogen					Carbondisulphide

DNH loudspeakers cover most ranges of temperature classes and gas groups. Most of our explosion proof range can be produced in either IIB or IIC versions upon request. We also produce one model, CM-6EExmNT, with the highest protection, suitable for gas group II.

