Standards **& Regulations**

for Gas Detectors


SUPREMATouch


ULTIMA X5000


PrimaX P


FL4000H


9010/9020 SIL


Senscient ELDS

MSA The Safety Company

Gas detectors are used to detect potential hazardous in the atmosphere, be they oxygen deficiency, toxic gas build-up or the accumulation of potentially explosive gas. Explosion protection is extremely important when dealing with flammable gases and vapours and this especially applies not only to equipment used in these areas, but also applies to the gas detectors themselves. Since gas detectors are categorised as electrical equipment, they must fulfil the relevant requirements for operating in potentially explosive areas. Within the European Union, this is regulated by using the relevant harmonised European Directives.

ATmosphere **EX**plosible is French for potentially explosive atmosphere. According to the ATEX manufacturer directive 2014/34/EU and user directive 1999/92/EC (ATEX 137) the electrical safety of all electronic gas detectors and personal monitors used in potentially explosive atmospheres must be tested and marked "ATEX" (EN 60079-0 et seq.). If the gas detector for flammable gases and vapours is used as a safety device "with a measuring function for explosion protection" it must be performance approved by a notified body in addition to the "ATEX" marking. Correspondence with other globally accepted standards (e.g. wheel mark approval) must also be ensured during the construction of the electrical equipment.

At MSA, we work tirelessly to build smarter, better gas detectors which people around the world can rely on.

Legal marking indicating that the equipment conforms to the requirements of the European Directives

Notified Body Identification Number INERIS 0080 EXAM/BVS 0158

Indicates the product can be used in explosive hazardous areas

Equipment group
I = Mining
II = Other areas

Equipment group and category

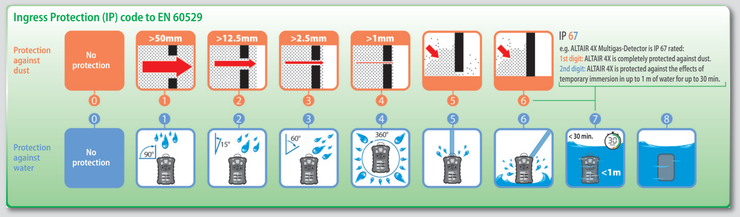
Gas zone	Dust zone	Equipment category	Group	Hazardous area characteristics – combustible atmosphere:
0	20	1	II	Present continuously or long periods or frequently (>1000 hours/year)
1	21	2	II	Likely to occur in normal operation occasionally (>10 <1000 hours/year)
2	22	3	II	Not likely to occur in normal operation or infrequently and for short periods (<10 hours/year)

Type of explosive atmosphere
G: Gas, mist, vapour
D: Dust

CENELEC/IEC

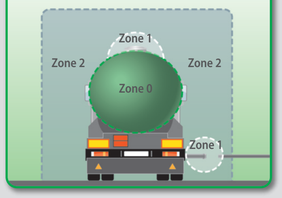
CE 0080 Ex II 2G Ex db ia mb IIC T4 Gb

ATEX marking



MED Marine Equipment Directive 2014/90/EU, or wheel mark, is an authorisation of equipment and products for the marine industry and covers any ship flying a flag of an EEA member state.

Explosive Atmosphere Zones:



Type of protection

Flameproof d
for zones 0, 1 and 2
The motor enclosure prevents an internal explosion being transmitted to the explosive atmosphere surrounding the machine. The enclosure must withstand any pressure levels caused by an internal explosion.

Increased safety e
for zones 1 and 2
Prevents sparks, arcs or hot spots during service (including starting using special control gear), that could reach the self-ignition temperature of the surrounding, potentially explosive, atmosphere.

Non sparking nA
for zone 2 only
Similar in construction to increased safety types, but only protecting against ignition of an explosive atmosphere, in normal operation and used within the ratings specified by the manufacturer.

Explosion protection

Types of protection (extract)
If it is not possible to rule out hazardous, potentially explosive atmospheres with primary explosion protection measures, secondary protective measures take effect. These measures stop the atmosphere igniting in various ways and are described by the types of protection.
Field of application (selection)
Switching devices and switchgear operating devices an indicators, controls, motors, transformers, heaters, luminaires.

Safety Concept	Type of protection	Code	
Special mechanical construction	Explosion-proof enclosure	da (application for Zone 0) only for catalytic portable detectors db (application for Zone 1) dc (application for Zone 2)	EN 60079-1 UL 1203 IEC 60079-1 FM 3615

Safety Concept	Type of protection	Code	Field of application (selection)	
Energy mechanical	Intrinsic safety Intrinsically safe systems	i	Measurement and control technology, fieldbus technology, sensors, actuators ia = used in Zones 0, 1, 2 ib = used in Zones 1, 2 ic = used in Zone 2 [Ex ib] = associated electrical equipment – installation in the safe area	EN 60079-11 UL 1203 IEC 60079-11 FM 3610 EN 60079-25 IEC 60079-25

Description	Equipment code Gas	Dust	Suitable zone Gas	Dust	EN standard Gas & Dust	Concept of protection
Encapsulation	Ex ma	Ex ma	0	20	EN 60079-18	Keep the flammable gas/dust out
	Ex mb	Ex mb	1,2	21,22	EN 60079-18	Keep the flammable gas/dust out
	Ex mc	Ex mc	2	22	EN 60079-18	Keep the flammable gas/dust out

Performance Approval
According to the ATEX manufacturer directive 2014/34/EU and the ATEX user directive 1999/92/EC any gas detection system (detectors and controller) and any personal monitor for flammable gases, if used as safety device to reduce the risk of explosion, has to be performance approved.

Performance approval is also required if the oxygen content of the air during inertisation or the concentration of toxic gas needs to be measured.
The EC type test certificate must then show compliance according to EN 60079-29-1 and EN 50104 for ATEX and EN 50104 and EN 45544 for oxygen and toxic gases (according to national regulations).

Equipment protection level (to EN 60079-26)
The level of protection assigned to equipment based on its risk of becoming a source of ignition and distinguishing the differences between explosive atmospheres.

Gas atmospheres:	Dust atmospheres:
Ga (application for Zone 0)	Da (application for Zone 20)
Gb (application for Zone 1)	Db (application for Zone 21)
Gc (application for Zone 2)	Dc (application for Zone 22)

Gas group	Representative test gas
I	Methane (mining only)
IIA	Propane
IIB	Ethylene
IIC	Hydrogen

Explosion groups for gases per IEC, CENELEC and NEC 505

Dust group	Representative dust
IIIA	Combustible flyings
IIIB	Non conductive dust
IIIC	Conductive dust

Temperature classification
Electrical equipment of Group II is divided into temperature classes based on with its maximum surface temperature.

Temperature classification per IEC, CENELECand NEC 505.

Temperature class	Maximum permissible surface temperature
T1	450 °C
T2	300 °C
T3	200 °C
T4	135 °C
T5	100 °C
T6	85 °C

Safety Integrity Level (SIL)
Functional Safety, as defined by IEC standard 61508, is the safety that control systems provide to an overall process or plant. A Safety Instrumented System (SIS) is designed to prevent or mitigate hazardous events by taking a process to a safe state when predetermined conditions are violated.
Each SIS has one or more Safety Instrumented Functions (SIF). To perform its function, a SIF loop has a combination of logic solver(s), sensor(s), and final element(s). Every SIF within a SIS will have a SIL level. These SIL levels may be the same, or may differ, depending on the process. It is a common misconception that an entire system must have the same SIL level for each safety function.
SIL stands for Safety Integrity Level. A SIL is a measure of safety system performance, in terms of probability of failure on demand (PFD). This convention was chosen based on the numbers: it is easier to express the probability of failure rather than that of proper performance (e.g., 1 in 100,000 vs. 99,999 in 100,000). There are four discrete integrity levels associated with SIL: SIL 1, SIL 2, SIL 3, and SIL 4. The higher the SIL level, the higher the associated safety level, and the lower probability that a system will fail to perform properly.
It is a common misconception that individual products or components have SIL ratings. Products and components are suitable for use within a given SIL environment, but are not individually SIL rated. SIL levels apply to safety functions and safety systems (SIFs and SISs). The logic solvers, sensors, and final elements are only suitable for use in specific SIL environments, and only the end user can ensure that the safety system is implemented correctly.

Safety Integrity Level	Risk Reduction Factor	Probability of Failure on Demand
SIL 4	100,000 to 10,000	10^{-5} to 10^{-4}
SIL 3	10,000 to 1,000	10^{-4} to 10^{-3}
SIL 2	1,000 to 100	10^{-3} to 10^{-2}
SIL 1	100 to 10	10^{-2} to 10^{-1}

The identification of risk tolerance is subjective and site-specific. When determining whether a SIL 1, SIL 2, or SIL 3 system is needed, the first step is to conduct a Process Hazard Analysis to determine the functional safety need and identify the tolerable risk level.


ALTAIR ALTAIR PRO


ALTAIR 2X


ALTAIR 4 XR


ALTAIR 5X PID


GALAXY GX2

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