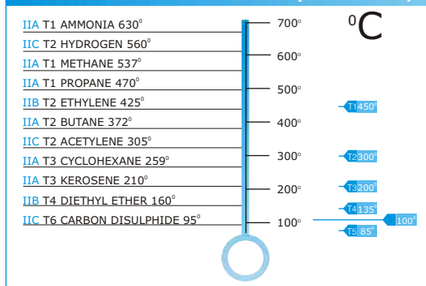
Pyrotech

AREA CLASSIFICATION

Guideline figure	Flammable atmosphere present continously >1000hrs/annum	Flammable atmosphere present intermittenly >10<1000hrs/annum	Flammable atmosphere present abnormally <10hrs/annum	standard
IEC/CENELEC/EUROPE				
Gas	Zone 0	Zone 1	Zone 2	IEC 60079-10:2002
Dust	Zone 20	Zone 21	Zone 22	IEC 61241-3:1997
NORTH AMERICA				
NEC 505 Gas	Zone 0	Zone 1	Zone 2	Listed in NEC Article 505-5
NEC 505 Gas & Dust	Division 1		Division 2	Listed in NEC Article 500-3(c)

IGNITION TEMPERATURE/ TEMPERATURE CLASS (T CLASS)



GAS GROUPING

Typical gas hazard	IEC60079-0 CENELEC En50014	North America NEC Article500 (Class I)*	Minimum ignition energy (microjoules)
ACETYLENE	IIC	A	20
HYDROGEN	IIC	B	20
ETHYLENE	IIB	C	60
PROPANE	IIA	D	180

Group II Electrical Apparatus for gas atmospheres 'G'	Code	CENELEC EN	IEC 60079	Permitted Zone ATEX category 0 / 1 / 2 / 3	REMARKS
Category 1G		50284			Permits combined method of protection
General requirements		50014	-0		Basic electrical requirements
Oil immersion	o	50015	-6		Protection by gas exclusion - transformers
Pressurised	p	50016	-3		Protection by gas exclusion - analysers
Powder filled	q	50017	-5		Protection by gas exclusion - weighing machines
Flameproof	d	50018	-1		Prevention of propagation of internal explosion - dc motors
Increased safety	e	50019	-7		Prevention by design - induction motors
Intrinsic safety	ia	50020	-11		Low energy. Safe with two faults - level measurment
Intrinsic safety	ib	50020	-11		Low energy. Safe with one faults - displays
Intrinsically safe systems		50039	-25		Considers combination of intrinsically safe apparatus
Fieldbus Intrinisically safe concept FISCO			-27		Technical specification. Will move to 'Standard' status. Zone 2 'nl' addition will be proposed (see below FNICO)
Encapsulated	m	50028	-18		Protection by gas exclusion
Type of protection 'n'	n	50021	-15		Prevention by desion

PHARMACEUTICAL

OIL AND GAS

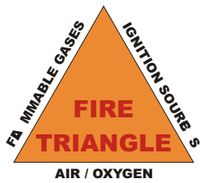
CHEMICAL

PETROLEUM

REFINERIES

PAINT

IRON & STEEL



ISO 9001 : 2000

DET NORSKE VERITAS
Certificate No. 00023-2003-AQ-BDA-RvA

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Purge & Ex-Proof

Purge and Explosion Proof Enclosure

In many industrial processes where flammable material are handled, any leakage or spillage may give rise to an explosive atmosphere. When these combine with oxygen, a highly combustible atmosphere is formed. On coming into accidental contact with an electric spark or a hot surface, this mixture may get ignited resulting in explosion and causing extensive damage to life and property.
Explosion protection is the science of designing and developing electrical products and enclosures for safe use in these highly explosive areas.

Enclosure for electrical equipment in hazardous locations is made safe by one of the three methods :

- Purged enclosure for housing with normal electrical equipment.
- Explosion proof enclosure for housing with normal electrical equipment.
- Normal enclosure for housing with explosion proof electrical equipment.

PURGING:-

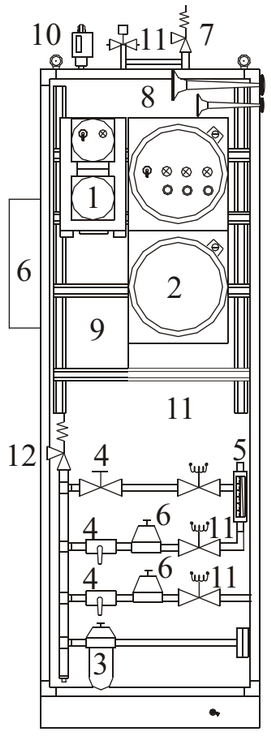
"Fluid always flows from higher pressure to lower pressure". It is the process of supplying an enclosure with clean air or an inert gas at sufficient flow & positive pressure to reduce to an acceptably safe level the concentration of any flammable gases or vapours initially present, and to maintain this safe level by positive pressure with or without continuous flow.

PRESSURIZATION WITH LEAKAGE COMPENSATION:

The operation of pressurized equipment can be divided into 3 phases :
A) PURGING PHASE
B) OPERATIONAL PHASE
C) PRESSURE FAILURE CONDITION
The first phase starts with energizing the control unit. An inert gas (usually clean air) flows through an Air Filter Regulator(AFR) in the enclosure to be purged to expel any potentially explosive gas / air mixture. The quantity of air required for purging must be at least 4 times the volume of the free space in the enclosure (as per NFPA - 496). The time for purging is calculated based on flow rate and volume of enclosure. The control circuitry is designed based on the above calculation.
In the operational phase, a positive pressure is maintained in the enclosure which prevents dangerous gases or vapours from entering in it & coming into contact with the arching electrical components, the installation after this can now be operated without any danger. pressure loss will be compensated by a by-pass solenoid valve .
In case of pressure failure, should the pressure of the enclosure fall below the value preset in the pressure regulator, then installation will signal the alarm and/or trip depending on the user (we take the preset value of lower pressure as 6 mm of water column, as per NFPA- 496)

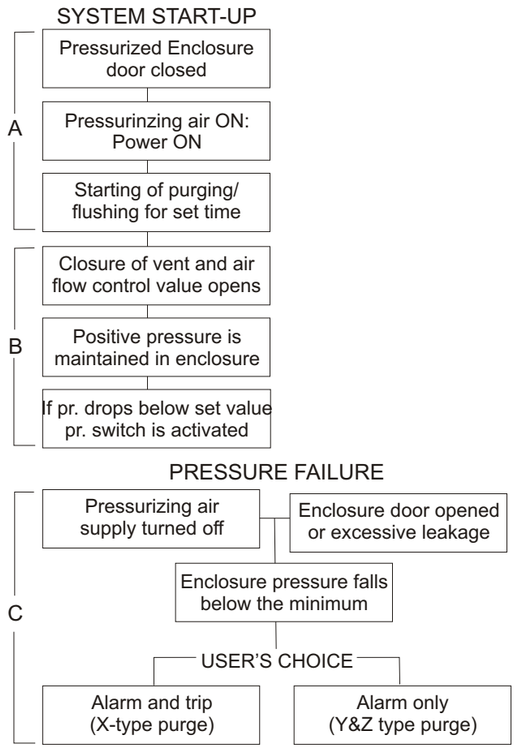
Components of a typical purge enclosure

1. Main isolator box: Ex-proof box through which incoming supply is controlled.
2. Main box: Ex-proof box containing control circuitry for purge control.
3. Air filter regulator: For flow of clean air inside the enclosure.
4. Air pressure controls: For controlling the flow of air inside the enclosure by air regulators including ball & needle valves as per requirement.
5. Air flow indication: Purge rotameter indicates and maintains the flow of inlet and leakage air.
6. Pressure monitoring: This is done through a U-tube or an inclined tube manometer mounted on the side of enclosure**.**
7. Over pressure release: This is through relief valves. The purpose is to prevent panel inlet pressures from exceeding the pre set values**.**
8. Audio alarm: A pneumatic hooter is used to indicate the alarm conditions.



9. Enclosure.
10 Pr.Switch: This switch is actuated when pressure falls below the minimum set pressure mark.
11. Solenoid valves: Suitably designed sov's help to make a logic control circuit for purging**.**
12. Presure relef valve:

PURGING SEQUENCE



Explosion proof enclosure for housings with normal electrical equipment
This is the second method to protect a control system against hazardous environment of a particular type.
At Pyrotech, we integrate the specially designed explosion proof enclosures(IS:2148), which are certified to work under a particular gas grouping as well as a particular temperature class, according to customer's requirements. The design and manufacture of the complete explosion proof control systems is done by using these ex-proof housings and normal electrical items are housed with in them.
However this method has a distinct constraint regarding the size of the housings, which has an upper limit, whereas in case of the pressurization method, enclosure as large as a room can also be protected from a potentially explosive environment .
This method is employed where the size of the enclosure is under limits and where the supply of air or inert gases is not available for pressurization.

Normal enclosure for housing with explosion proof electrical equipment.
This is the third method by which our criterion of explosion protection can be achieved. In this case we use the explosion proof electrical equipments which are certified to work under a particular working environment .