

General:

The quality of our products has been certified by many different certification bodies and authorities. HUMMEL AG is a certified manufacturer and supplier of electro-mechanical devices.

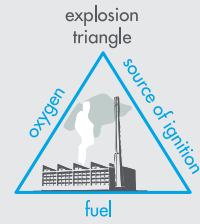


What is an explosion?

So that an explosion can occur, three conditions must be fulfilled; see the explosion triangle diagram.

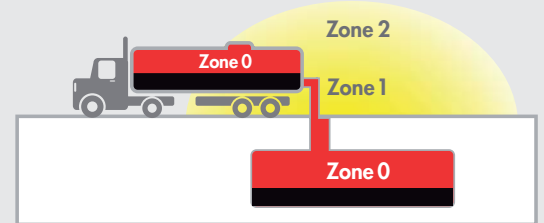
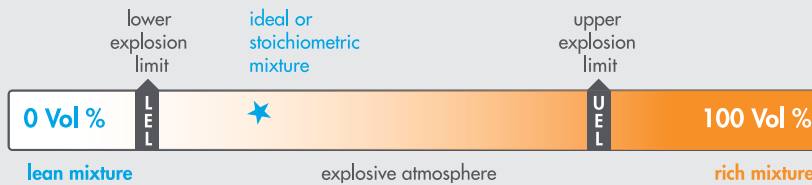
1. Fuel
2. Oxygen
3. Source of ignition

If one removes one of these three conditions, an explosion cannot occur.



Potentially Explosive Atmosphere

A potentially explosive atmosphere is understood to be a mixture of a combustible material and oxygen. Oxygen is generally present as a component of air. Combustible materials can be e.g.: gases, fluids, vapours, mist or dusts. If the proportion of oxygen falls below a certain value dependent on the material, known as the oxygen limit concentration, then this mixture cannot be ignited.



Zones IEC/CENELEC/ATEX

| Zone | Description |
|----------------|---|
| Zone 0 | relates to areas in which a potentially explosive atmosphere consisting of a mixture of air and gases, vapours or mist exists continuously, for long periods or frequently |
| Zone 1 | relates to areas in which it can be considered that a potentially explosive atmosphere of gases, vapours or mist occurs occasionally |
| Zone 2 | relates to areas in which it is unlikely that a potentially explosive atmosphere of gases, vapours or mist might occur, but if it does occur then in all probability only seldom and for a short period |
| Zone 20 | relates to areas in which a potentially explosive atmosphere consisting of a mixture of dust and air exists continuously, for long periods or frequently |
| Zone 21 | relates to areas in which it can be considered that a potentially explosive atmosphere of a mixture of dust and air occurs occasionally |
| Zone 22 | (note the difference between conductive and non-conductive dust!) relates to areas in which it is unlikely that a potentially explosive atmosphere of suspended dust might occur, but if it does occur then in all probability only seldom and for a short period |

Appartous Group and Device Category EPL

Group I Mining

- M1 high degree of safety EPL Ma
- M2 high degree of safety EPL Mb

Group II Non-Mining

- 1 very high degree of safety
 - Gas (Zone 0, 1, 2) EPL Ga
 - Dust (Zone 20, 21, 22) EPL Da
- 2 high degree of safety
 - Gas (Zone 1, 2) EPL Gb
 - Dust (Zone 21, 22) EPL Db
- 3 normal degree of safety
 - Gas (Zone 2) EPL Gc
 - Dust (Zone 22) EPL Dc

Gases and Dust

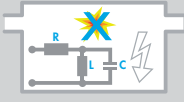

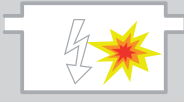
| Gas | Dust |
|---------------|--------------------------|
| IIA Propane | IIIA combustible dust |
| IIB Ethylene | IIIB non-conductive dust |
| IIC Hydrogene | IIIC conductive dust |

Temperature Classes


| Temperature class | Highest permissible surface temperature of the operating facility | Ignition temperature of combustible materials |
|-------------------|---|---|
| T1 | 450 °C | > 450 °C |
| T2 | 300 °C | > 300 °C < 450 °C |
| T3 | 200 °C | > 200 °C < 300 °C |
| T4 | 135 °C | > 135 °C < 200 °C |
| T5 | 100 °C | > 100 °C < 200 °C |
| T6 | 85 °C | > 85 °C < 100 °C |

Protection Concepts

Electrical

| | | | | | |
|----------------------|-------|--------------------------|------------|--|---|
| Intrinsic safety | Ex-ia | IEC 60079-11/EN 60079-11 | Zone 0,1,2 | Limit the energy |  |
| Intrinsic safety | Ex-ib | IEC 60079-11/EN 60079-11 | Zone 1,2 | | |
| Intrinsic safety | Ex-ic | IEC 60079-11/EN 60079-11 | Zone 2 | | |
| Increased safety | Ex-e | IEC 60079-7/EN 60079-7 | Zone 1,2 | No arcs, sparks or hot surfaces, IP54 or better. |  |
| Flameproof enclosure | Ex-d | IEC 60079-1/EN 60079-1 | Zone 1,2 | Contain the explosion Use a flamepath. |  |

Dust Protection

| | | | | | |
|-----------|------|--------------------------|---------------|---------------------------|---|
| Enclosure | Ex-t | IEC 60079-31/EN 60079-31 | Zone 20,21,22 | Dust tight enclosure IP6X |  |
|-----------|------|--------------------------|---------------|---------------------------|---|

International Protection, EN 60529

| 1. Code | | 2. Code | Penetration of water | | | | | | | | | |
|--|---|---------|----------------------|---|--|--|---|--|---|---|---|--|
| | | | Non-protected | protection against drip water (or dripping water) | Protected against vertically falling water drops when device is tilted up to 15° | Water sprayed at an angle up to 60° on either side of the vertical shall have no harmful effects | Water splashed from any direction shall have no harmful effects | Water projected in jets from any direction shall have no harmful effects | Water projected in powerful jets from any direction shall have no harmful effects | protection against temporary submersion | protection against permanent submersion | |
| Protection against human access to hazardous parts | Protection of equipment against penetration of solid foreign objects | | IP x0 | IP x1 | IP x2 | IP x3 | IP x4 | IP x5 | IP x6 | IP x7 | IP x8 | |
| Non-protected | Non-protected | IP 0x | IP 00 | | | | | | | | | |
| Protected against access to hazardous parts with the back of the hand | Protected against solid foreign objects larger in diameter than 50 mm | IP 1x | IP 10 | IP 11 | IP 12 | | | | | | | |
| Protected against access to hazardous parts with a finger | Protected against solid foreign object larger in diameter than 12,5 mm | IP 2x | IP 20 | IP 21 | IP 22 | IP 23 | | | | | | |
| Protected against access to hazardous parts with a tool larger in diameter than 2,5 mm | Protected against solid foreign objects larger in diameter than 2,5 mm | IP 3x | IP 30 | IP 31 | IP 32 | IP 33 | IP 34 | | | | | |
| Protected against access to hazardous parts with a wire larger in diameter than 1,0 mm | Protected against solid foreign objects larger in diameter than 1 mm | IP 4x | IP 40 | IP 41 | IP 42 | IP 43 | IP 44 | | | | | |
| Protected against access to hazardous parts with a wire larger in diameter than 1,0 mm | Prevents penetration of dust sufficient to cause damage inside the equipment. | IP 5x | IP 50 | | | | IP 54 | IP 55 | | | | |
| Protected against access to hazardous parts with a wire larger in diameter than 1,0 mm | Dust proof | IP 6x | IP 60 | | | | | IP 65 | IP 66 | IP 67 | IP 68 | |

EXIOS Standards

IEC 60079-0:2007-10
EN 60079-0:2009
EN 60529

IEC 60079-1:2007-4
EN 60079-1:2007

IEC 60079-7:2006-7
EN 60079-7:2007

IEC 60079-31:2008
EN 60079-31:2009