

Protection level (category) „ia“ and „ib“

The definition of protection levels „ia“ and „ib“ is (see 5.2 and 5.3 DIN EN 50020):

Protection level „ia“:

When voltages U_m and U_i are applied, intrinsically safe currents in electrical equipment of protection level „ia“ are not capable of causing ignition in any of the following cases:

- In operation without interference and with the uncountable faults that result in the most unfavourable condition present
- In operation without interference and with one countable fault present in addition to the uncountable faults that result in the most unfavourable condition present;
- In operation without interference and with two countable faults present in addition to the uncountable faults that result in the most unfavourable condition present;

Protection level „ib“:

When voltages U_m and U_i are applied, intrinsically safe currents in electrical equipment of protection level „ib“ are not capable of causing ignition in any of the following cases:

- In operation without interference and with the uncountable faults that result in the most unfavourable condition present
- In operation without interference and with one countable fault present in addition to the uncountable faults that result in the most unfavourable condition present.

Explosion groups

There is an additional sub-division for electrical equipment of group II for potentially explosive gas/air mixtures:

The ignition capability and ignition breakdown behaviour of a potentially explosive mixture are properties typical of a substance. Gases and vapours are subdivided into explosion groups. The criteria for sub-division are the maximum permitted gap and the minimum ignition current.

The maximum experimental safe gap (MESG) and minimum ignition current (MIC) are determined under precise experimental conditions for different gases.

The following list provides an overview of explosion groups with examples of gases and vapours:

Explosion group IIA:

Acetone, ethane, ethyl acetate, ammoniac, benzole (pure), acetic acid, acetic anhydride, toluole, i-amyl acetate, n-butane, n-butyl alcohol, benzines, n-hexane, diesel fuel, acetic aldehyde, phenol

Explosion group IIB:

Ethyl ether, ethylene, ethylene oxide, ethyl alcohol, hydrogen sulphide, city gas (illuminating gas)

Explosion group IIC:

Acetylene, carbon sulphide, hydrogen

The danger level of gases increases from Explosion group IIA to IIC. The requirements for electrical equipment for these explosion groups increase accordingly. Because of this the Explosion group for which electrical equipment is designed must be specified on it if the explosion protection depends on the maximum permitted gap (Ignition protection class EEx d) or the minimum ignition current (Ignition protection class EEx i).

Electrical equipment that is approved for IIC can also be used for all other explosion groups, while equipment for IIB can also be used for Explosion group IIA.

Temperature classifications

The ignition temperature of a flammable gases or flammable liquid is the lowest temperature at which the mixture susceptible to ignition can still be brought to explosion under the conditions specified according to DIN 51794.

This makes it possible to classify flammable gases and vapours into temperature classifications according to their capacity to ignite. The maximum surface temperature of a piece of electrical equipment must always be less than the ignition temperature of the gas or vapour/air mixture in which it is used.

Of course equipment that meets the requirements of a higher temperature class (for example) is also approved for applications for which a lower temperature class is required (for example T2 or T3).

If the maximum surface temperature of a piece of equipment reaches the ignition temperature of the surrounding atmosphere that is capable of igniting, an ignition can occur. Because of this, all electrical equipment is divided into temperature classes. The lowest ignition temperature of the potentially explosive atmosphere in question must be greater than the maximum surface temperature (special specifications apply to surfaces of not more than 10 cm² altogether).

The temperature classes apply to an ambient area of from -20 °C to +40 °C. EN 50014 requires additional marking by the symbol „T_a“ or „T_{amb}“ for use in another temperature range.

Group I: 150 °C (with possible accumulations of coal dust)
 450 °C (without risk of coal dust accumulations)

Group II

Assignment of maximum surface temperature to temperature classes	
Temperature class	max. surface temperature [°C]
T1	450
T2	300
T3	200
T4	135
T5	100
T6	85

Note:

Equipment for use in explosive dust atmospheres is not categorised by temperature classifications in terms of its surface temperature. For these devices, the highest surface temperature is specified. It must be reduced by 1/3 if there is danger caused by a dust cloud or by 75 K in the event of ignition hazard due to an accumulation of dust.

Marking of electrical equipment

The marking that has been prescribed for many years now is specified in DIN EN 50014. This marking, referred to as the technical marking or identification remains in place. In addition to these requirements, ATEX 95 and its implementation through ExVO also contain an „ATEX marking“.

Appendix II of ATEX 95 requires the following under „basic requirements“:

- Name and address of the manufacturer,
- CE-Marking,
- Identification of series and type, year of manufacture and if applicable the serial number
- The identifier  together with the identifier referring to the category (1/2/3)
- The letter G (gas) or D (dust) to identify the potentially explosive atmosphere

This information must all appear on the device. The advantage of this innovation is that it clearly indicates the zone in which it is appropriate to use the device in question.

In addition, and if necessary, all notices essential for safety when using the device must be affixed (note: this notice can only be the specific working of the ATEX text).