CLASSIFICATION OF ELECTRICAL APPARATUS INTO EXPLOSION GROUPS AND TEMPERATURE CLASSES

It would be uneconomical and sometimes not even possible to always construct all explosion protected electrical equipment to the maximum requirements, independent of its respective application. It is therefore divided into groups and temperature classes.
The European Standards differentiate - as the IEC recommendations - between two groups of equipment:
Group I: electrical equipment for mining
Group II: electrical equipment for all remaining hazardous areas.
For electrical apparatus of group II there can be further classification into explosion groups and temperature classes. This is to be explained in the following:

Explosion groups

Ignitability and explosion characteristics of an explosive mixture are properties typical of the material. The requirements for the construction of explosion protected electrical apparatus can be graduated depending on the gases and vapours existing in the planned application. This refers on one hand to the required joint dimensions of the flameproof encapsulation, on the other hand the max. permissible current and voltage values in intrinsically safe circuits vary for each gas mixture.
The gases and vapours are therefore classified into several explosion groups. Classification criteria are the "Maximum Experimental Safe Gap" (MESG) or the "Minimum Ignition Current" (MIC), which are determined according to a stipulated testing order. On the electrical apparatus it is stated accordingly for which explosion group it is suitable.
The danger of gas increases from explosion group IIA to IIC according to EN (or from Group D to Group A according to the NEC classification). The requirements for electrical apparatus for these explosion groups increase accordingly. Electrical apparatus certified for IIC for example is of course suitable for all other explosion groups.

Temperature classes

The ignition temperature, i.e. the temperature, at which an ignition could occur for example due to a hot surface of the apparatus, is dependent on the type of existing gases or vapours. This ignition temperature is influenced by several factors and is thus dependent on the stipulated testing order. Depending on the measuring system the results can thus differ in the various countries. Further information regarding materials, not stated can be found in the respective guidelines and literature.
The max. temperature of the exposed surface of electrical apparatus must always be lower than the ignition temperature of the gas or vapour mixture, where it is to be used.
In order to be able to mark and select electrical apparatus simply in regard to its max. surface temperature, there are several temperature classes. The gases can be classified to the temperature classes according to their ignition temperature, whereby the max. surface temperature of the respective class must be lower than the ignition temperature of the corresponding gases. Apparatus of course, meeting a higher temperature class (e.g. T5) can be used for applications requiring a lower temperature class (e.g. T2 or T3).

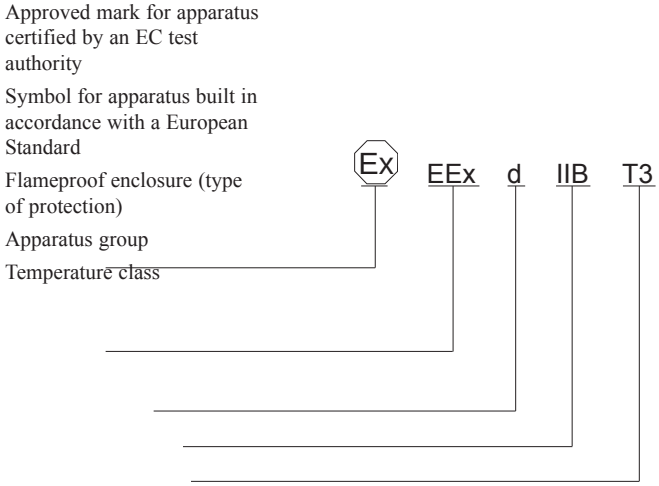
Temperature class	Max. surface temperature	Ignition temperature of combustible material
T1	450° C	>450° C
T2	300° C	>300° C
T3	200° C	>200° C
T4	135° C	>135° C
T5	100° C	>100° C
T6	85° C	>85° C

Classification of maximum surface temperatures for Group II electrical apparatus.

Marking of explosion protected electrical apparatus

In addition to the general data (make, type, serial no., electrical data), data concerning the explosion protection is to be added. The European Standards call for the following marking, adapting to the IEC recommendation:

Example:



SAFETY CHARACTERISTICS OF FLAMMABLE GASES AND VAPOURS*

Medium	Ignition temperature°C	Temperature class	Explosion group
Acetaldehyde	140	T4	IIA
Acetic acid	485	T1	IIA
Acetic anhydride	330	T2	IIA
Acetone	540	T1	IIA
Acetylene	305	T2	IIC(3)
Ammonia	630	T1	IIA
Amylacetate	380	T2	IIA
Benzine	220	T3	IIA
Benzol	555	T1	IIA
Carbon disulphide	95	T6	IIC(1)
Carbon Oxide	605	T1	IIA
Cyclohexene	430	T2	IIA
1,2-Dichlorethane	440	T2	IIA
Diesel fuel	220 up to 300	T3	IIA
Ethane	515	T1	IIA
Ethylacetate	460	T1	IIA
Ethylalcohol	425	T2	IIA IIB
Ethylchloride	510	T1	IIA
Ethylene	425	T2	IIB

Medium	Ignition temperature°C	Temperature class	Explosion group
Ethylenoxyd	440	T2	IIB
Ethylether	180	T4	IIB
Ethylglycol	235	T3	-•)
Fuel oil	220 up to 300	T3	IIA
Hydrogen aeroxid	560	T1	IIC (2)
Hydrogen disulphide	270	T3	IIB
Methane	595(650)	T1	IIA
Methanol	455	T1	IIA
Methylchloride	625	T1	IIA
n-Butane	365	T2	IIA
n-Butylalcohol	340	T2	IIA
n-Hexane	240	T3	IIA
n-Propylalcohol	405	T2	-•)
Naphthaline	520	T1	IIA
Oleic acid	360	T2	-•)
Phenol	595	T1	IIA
Propane	470	T1	IIA
Tetraline	425	T2	-•)
Toluole	535	T1	IIA

*Appendix B, VDE 0165/9.83
-• The explosion group for this medium has not yet been defined
(1) Also Explosion group IIB + CS_2 (2) Also Explosion group IIB + H_2 (3) Also Explosion group IIB + C_2H_2