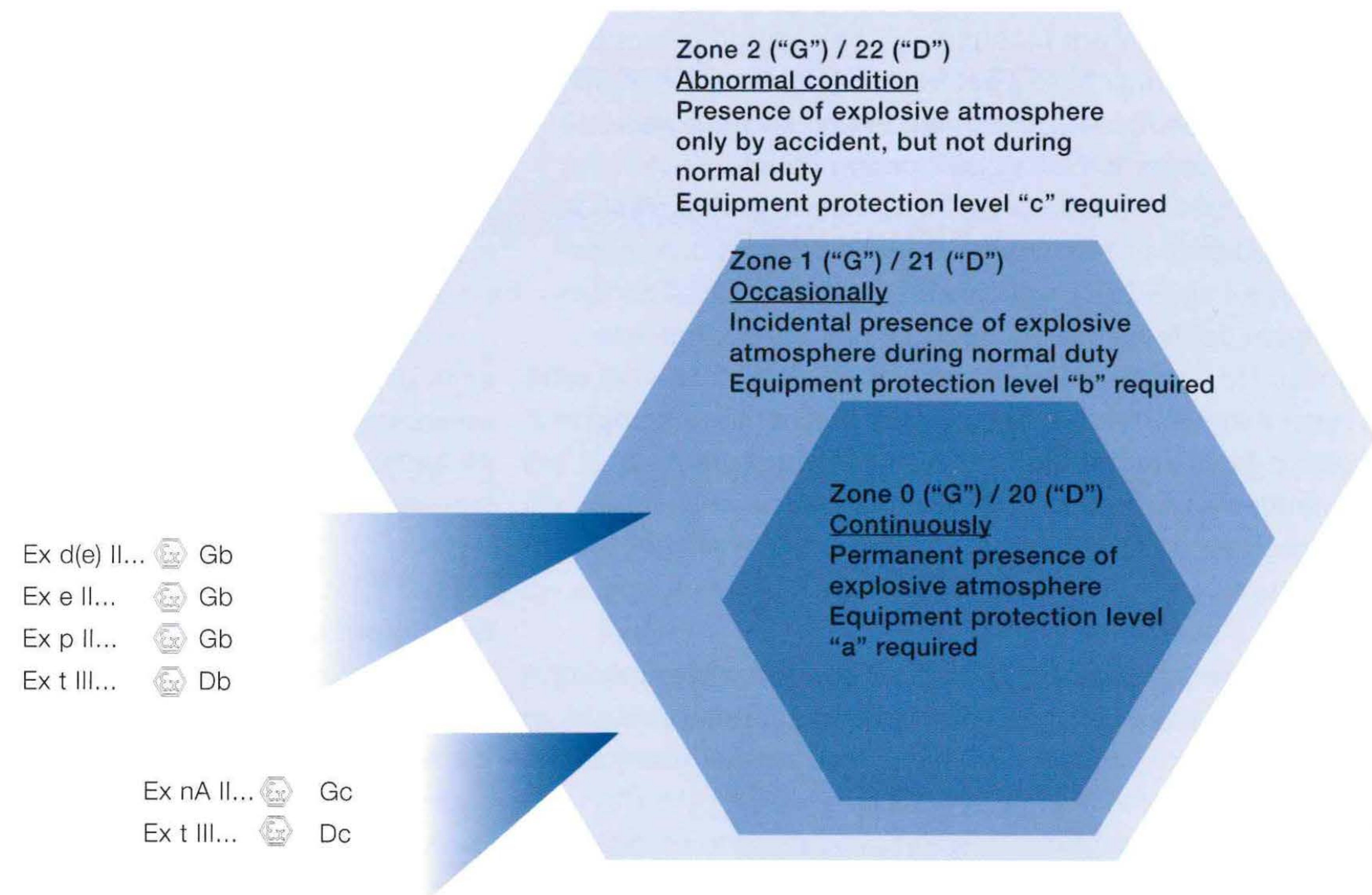
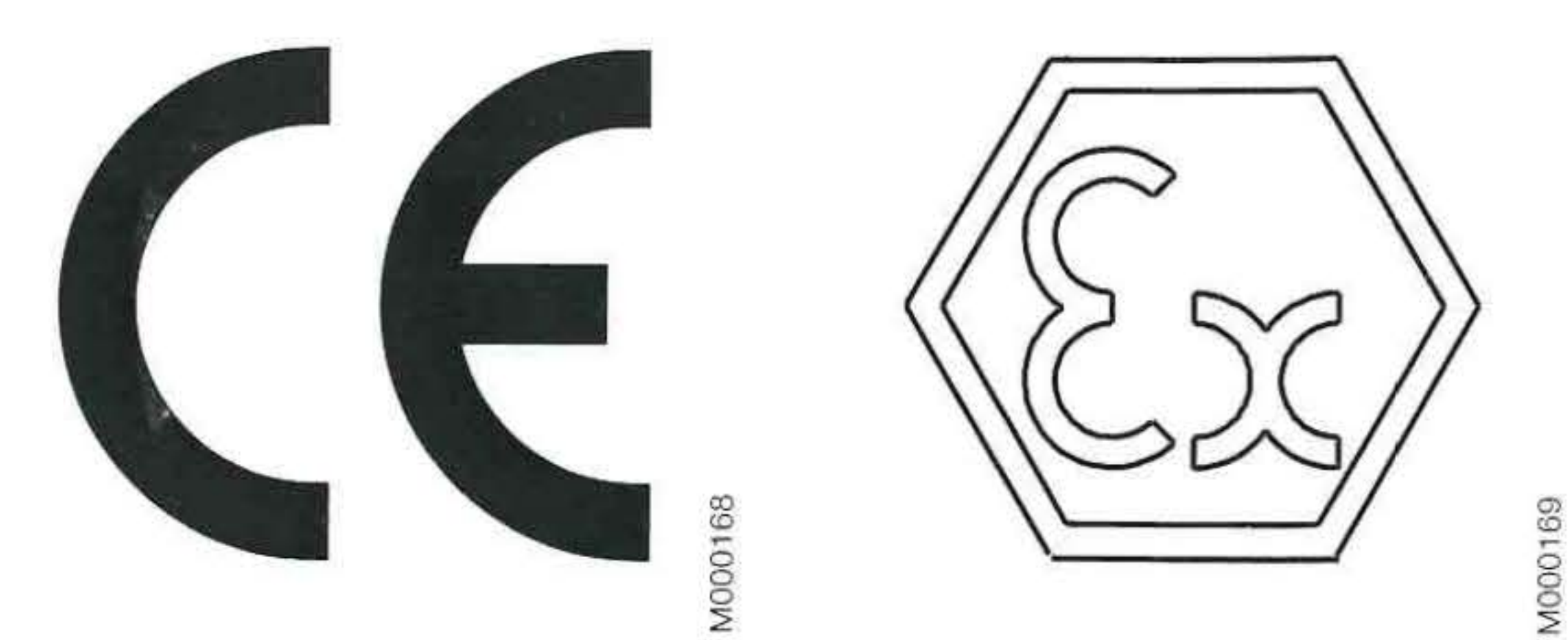


Explosive atmospheres

There are systems in place worldwide to classify explosive atmospheres by zones, according to the risk posed by explosive gas ("G") or dust ("D").



Classification of explosive atmospheres according to CENELEC and IEC

The following standards define areas according to the presence of gas or dust in the atmosphere:
IEC/EN 60079-10-1 Gas
IEC/EN 60079-10-2 Dust

Standard IEC 60079-0 EN 60079-0	Installation Zone acc. to IEC 60079-10-x EN 60079-10-x		ATEX Directive 94/9/EC	Main motor protection types	
Group	EPL	Protection level	Equipment group	Equipment category	
I (Mines)	Ma	very high	I (Mines)	M1	NA
	Mb	high		M2	
II (Gas)	Ga	very high	II (Surface)	1G	NA
	Gb	high		2G	Ex d/Ex de Ex p, Ex e
	Gc	enhanced		3G	Ex nA
III (Dust)	Da	very high		1D	NA
	Db	high		2D	Ex tb IP 65
	Dc	enhanced		3D	Ex tc IP 65/IP 55

Marking of temperatures, gas groups and explosive atmospheres

To ensure equipment can be safely used in potentially explosive atmospheres, the explosive atmospheres where the equipment is installed must be known. The temperature class of equipment must be compared with the spontaneous

ignition the equipment of the gas mixtures concerned, and in specific cases the gas group must be known (e.g. flame proof protection).

Classification

Gas classification

Temperature class	Ignition temp. of gas/ vapor °C	Max. permitted temp. of equipment °C	Gas examples
T1	> 450	450	Hydrogen
T2	> 300 < 450	300	Ethanol
T3	> 200 < 300	200	Hydrogen sulfide
T4	> 135 < 200	135	Diethyl ether
T5	> 100 < 135	100	-
T6	> 85 < 100	85	Carbon disulfide

Gas subdivision

IIA	~120 gases and vapors, e.g. butane / petroleum / propane
IIB	~30 gases and vapors, e.g. ethylene / dimethyl ether / coke oven gas
IIC	three gases: hydrogen H ₂ /acetylene C ₂ H ₂ /carbon disulfide CS ₂

Marking of equipment protection for gas according to ATEX

CE Conformity marking

CE 0081 II 2G

CE marking

Identification of the notified body responsible for the approval. 0081 is the identification number of LCIE

The European Commission mark for Ex products

Equipment group: II for surface industry

Equipment category: 2G for gas environment demanding a high level of protection

Equipment protection marking for gas:

Ex d IIB T4 Gb

Protection type Ex d = flameproof

Equipment group IIB for gas group B

Temperature class T4 = max. permitted 135 °C

Equipment protection level = level b for gas

Marking of equipment protection for gas according to IEC

Example for gas:

Ex d IIB T4 Gb

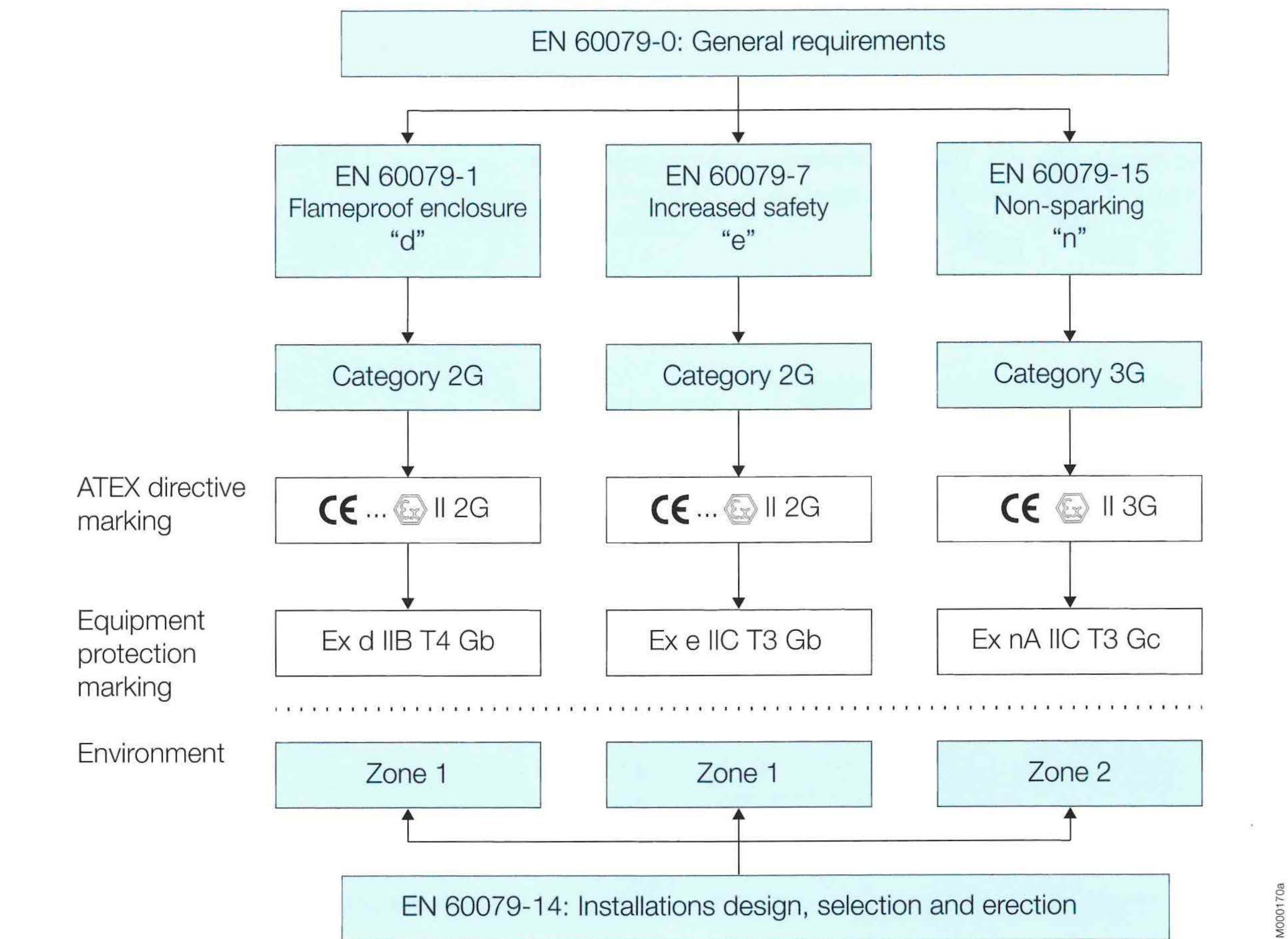
Protection type Ex d = flameproof

Equipment group IIB for gas group B

Temperature class T4 = max. permitted 135 °C

Equipment protection level = level b for gas

Selection of products for explosive atmospheres EN Standard and ATEX Directive for gas environments



General information about explosive atmospheres

In explosive atmospheres, it is of the utmost importance to ensure the safe use of electrical apparatus. To this end, many countries have regulations concerning both the design and use of such apparatus. These regulations are becoming increasingly harmonized within the framework of IEC recommendations and European Standards. The hazard may

be due to an explosive atmosphere composed of a mixture of gas, vapors or dusts with air. This section is concerned only with safety in explosive gas atmospheres for which European Standards and IEC recommendations exist.

Flameproof enclosure Ex d and Ex de

The motor enclosure is designed in such a way that no internal explosion can be transmitted to the explosive atmosphere surrounding the motor. The enclosure must withstand, without damage, any pressure levels caused by an internal explosion. The shape, length and gap of joints of part assemblies, at shaft openings, cable entries, etc., shall be designed to allow for throttling and cooling of hot gases escaping outside. The standards emphasize the impact of an explosive atmosphere (for instance, explosion pressure) over constructional requirements of such apparatus.

Work on accessories of enclosure componenets is only permitted using prescribed tools. Cable entries must meet the requirements of this type of protection.

The temperature of the motor's external enclosure shall not exceed the self-ignition temperature of the explosive atmosphere of the installation area during operation. For this reason, rated output depends on this rated maximum temperature for the area in question. The standard temperature class on flame proof motors from ABB is T4 (135 °C), other temperature classes as T5 (100 °C) and T6 (85 °C) are available on request.

No motor device outside the flameproof enclosure (e.g., ventilator) shall be a potential source of sparks, arcs or dangerous overheating.

Variants combining two types of protection usually combine "d" and "e" protection. The motor is designed with an Ex d flameproof enclosure, while the terminal box features Ex e increased safety protection. Such design combines the superior safety degree of the "d" type of protection with the high electrical connection requirements of increased safety motors.

Alleinschutz – thermistors as sole protection (optional)
Flameproof motors from ABB have been designed to use thermistors as the sole method of protection against overload. This construction, "Alleinschutz", is available as an option, see variant codes.

"Alleinschutz" refers to the protection of a flameproof motor by a protective device which is triggered by thermistors. The thermistors and relays will switch off the motor in case of overheating before the temperature of the motor's external enclosure exceeds the temperature marking stamped on the rating plate.

Each motor ordered with thermistors as sole protection will be tested, with locked rotor, up to the point where the thermistors trigger the relay to turn off the motor. At the triggering temperature, the motor has to be within the certified temperature class limit.

Only approved relays can be used for "Alleinschutz".

Please note that sizes 315 to 450 require special technical solutions, consult ABB.

Dust ignition protection / Protection by enclosures “t” in explosive atmospheres

Combustible dust is hazardous as it can form potentially explosive atmospheres when dispersed in air. Furthermore, layers of combustible dust may ignite and act as an ignition source for an explosive atmosphere. Explosive atmospheres with dust can be found in a variety of industries such as agriculture, chemicals, plastics, food and beverage.

Selection and installation of electrical equipment

To ensure equipment can be safely used in explosive atmospheres with dust, it is vital that the following issues are taken into account when selecting product:

1. Type of dust:

- Will a cloud of dust be present around the product or
- will a layer of dust build up on the product and if so, what will be the maximum thickness of the layer between two cleaning/maintenance procedures.

2. Characteristics of the dust:

- Is the dust electrically conductive or non-conductive?

3. Ignition temperature of the dust:

- T_{Cl} : Ignition temperature of dust in a “cloud” or
- T_{5mm} : Ignition temperature of a 5 mm dust layer

Selection and installation of the product according to IEC/EN60079 part 14: Electrical installations design, selection and erection. Please see the tables on the pages 12 and 13. Please see the table on page 14.

Dust classification

		T_{cl} (cloud) °C	T_{5mm} (layer) °C	Surface temperature provided that dust layer below 5 mm
Food/Feeder industry	Wheat	350	270	195
	Barley, corn	380	280	205
	Sugar	350	430	233
Natural materials	Wood	330	280	205
	Charcoal	520	230	195
	Hard coal	460	240	165
Chemicals	PVC	450	330	255
	Synth. rubber	470	220	145
	Sulfur	240	250	160

Source BIA-report 13/97 HVBG

This protection prevents any explosion of dust because:

- The ingress of dust into the motor is prevented by the IP protection, being either IP 55 (“dust protected”) or IP 65 (“dust tight”).
- The maximum surface temperature outside the motor must not exceed the temperature class for which the motor is certified.
- No sparks must occur outside the motor enclosure.

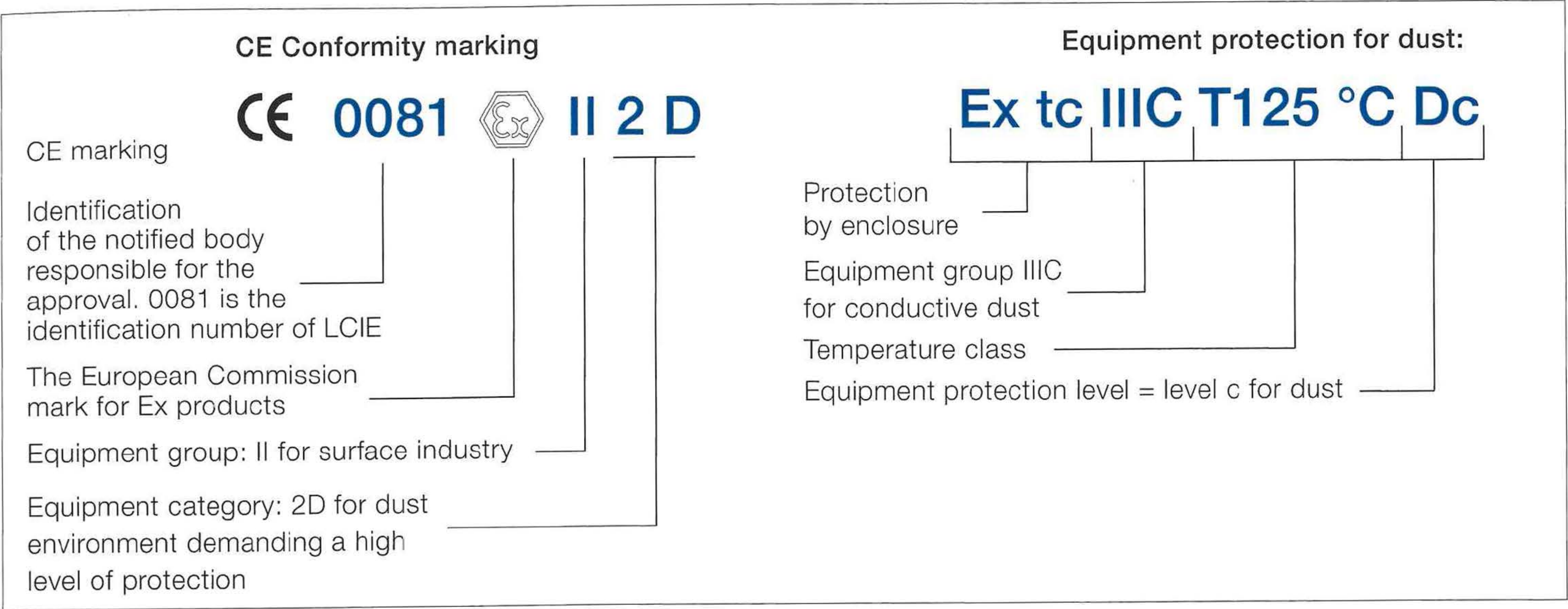
Certification: Ex tb IIIB/C T...°C Db (for zone 21) motors are certified according to ATEX with an EC type examination certificate and according to the IEC Ex System. Ex tc IIIB/C T...°C Dc (for zone 22) motors are certified according to ATEX with a “voluntary type examination certificate” and according to the IEC Ex System.

The standard surface temperature class on dust ignition protection motors from ABB is T125 °C, other temperature classes are available on request.

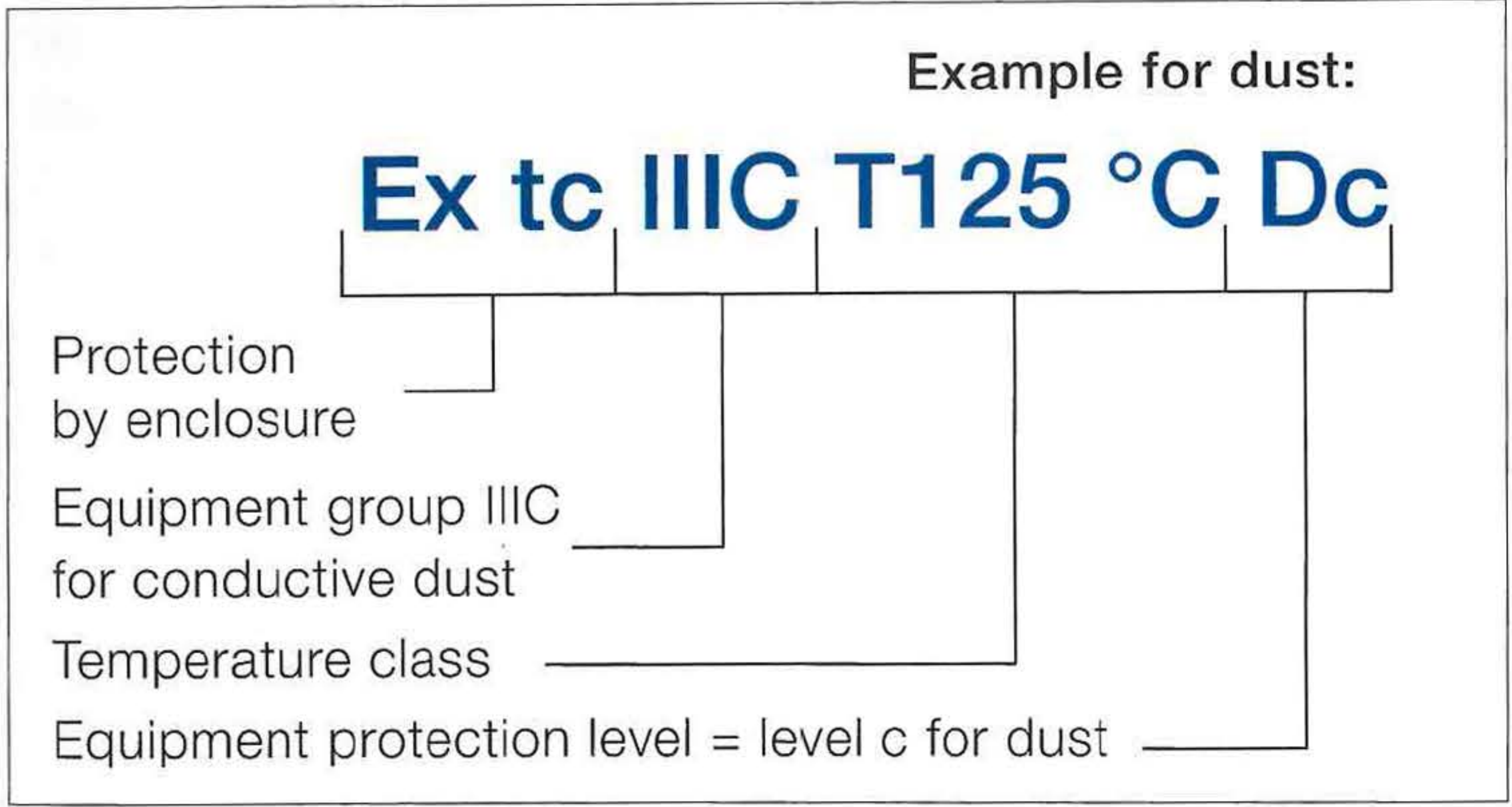
Dust subdivisions

IIIA	combustible flyings
IIIB	non-conductive dust
IIIC	conductive dust

Marking of equipment protection for dust according to ATEX



Marking of equipment protection for dust according to IEC



Selection of products for explosive atmospheres

EN Standard and ATEX Directive for dust environments

