Your Global Automation Partner

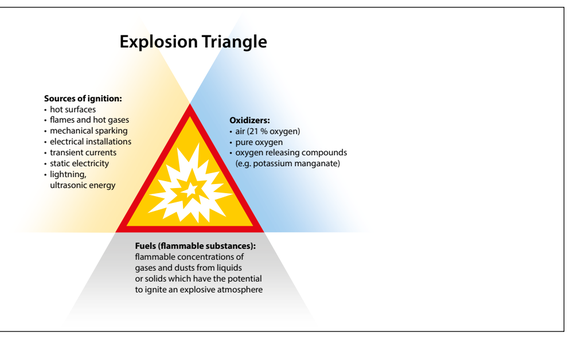
Overview
Explosion Protection Conform to 2014/34/EU

Basis for the Selection of the Equipment

Zoning

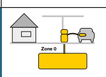
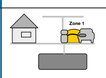
Classification of potentially explosion hazardous areas									
Duration – for information only		Continuous hazard			Occasional hazard			Temporary hazard		
	IEC CENELEC Europe	Zone 0 (gas)	Zone 20 (dust)	Zone 20 (lint)	Zone 1 (gas)	Zone 21 (dust)	Zone 21 (lint)	Zone 2 (gas)	Zone 22 (dust)	Zone 22 (lint)
Equipment protection level (EPL)		Ga	Da	Da	Gb	Db	Db	Gc	Dc	Dc
	North America	Class I	Class II	Class III	Class I	Class II	Class III	Class I	Class II	Class III
		Division 1 (gas and dust)						Division 2 (gas and dust)		

Preconditions for an Explosion



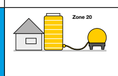
Equipment Categories

Gas-Ex area (ATEX)

Gas			
Zone	**Symbol**	**Category**	**Protection requirements**
0		1 G required	2 independant means of protection
1		2 G required, 1 G possible	1 independent protective measure against generally arising disturbances and faults
2		3 G required, 1 G, 2 G possible	Normal operation

Equipment Categories

Dust-Ex area (ATEX)

Dust			
Zone	**Symbol**	**Category**	**Protection requirements**
20		1 D required	2 independent protective measures
21		2 D required, 1 D possible	1 independent protective measure against generally arising disturbances and faults
22		3 D required, 1 D, 2 D possible	Normal operation

Dust Groups

Dust-Ex area

Dust groups	
Categorie	**Materials**
IIIA	Flammable lints
IIIB	Non-conductive dust
IIIC	Conductive dust

Complete Marking (for example)

Legal and technical marking

In summary, an intrinsically safe equipment for use in Zone 0 has the following complete marking:							
II	1	G	Ex	ia	IIC	T6	Ga
or also for the dust explosion hazardous area:							
II	1	D	Ex	ia	IIIC	T140 °C	Da

In summary an associated apparatus with loops for Zone 0 has the following marking:						
II	(1)	G	[Ex	ia	Ga]	IIC
or also for the dust explosion hazardous area:						
II	(1)	D	[Ex	ia	Da]	IIIC

Marking of a associated apparatus for application in zone 2										
II	3	G	Ex	nA	nC	[ic	Gc]	IIC/IIB	T4	Gc

IEC resp. EN 60079-…

Technical marking

Marking of an intrinsically safe apparatus (for example):				
Ex	**ia**	**IIC**	**T6**	**Ga**
Conform to Ex standard	Type of protection (2 independent protective measures)	Explosion group	Temperatur class	Equipment protection level

Marking of an associated apparatus (for example):					
[	**Ex**	**ia**	**Ga**	**]**	**IIC**
Associated apparatus	Conform to Ex standard	Type of protection	Equipment protection level (EPL)	Associated apparatus	Explosion group

ATEX Directive

EU type examination certificate

Marking of the EU type examination certificate acc. to ATEX:				
PTB	**13**	**ATEX**	**2013**	**X**
Authorised body	Year of issue	According to 2014/34/EU	Serial certificate number	Special conditions

ATEX Directive

Legal marking

CE 0102

Within the EU, the equipment must comply with the appropriate provisions.
If a manufacturer meets these requirements, then the device is marked with the CE label.

For the explosion protection according to the ATEX directive this label will be expanded. To the CE label the number of the notified body is added, which has carried out the QS-certification. This means, for example, that the review body of the TÜV/Hannover has the identification number 0044, the PTB in Braunschweig the 0102 and the DEKRA EXAM (BVS) in Bochum the 0158.

Marking of an intrinsically safe apparatus acc. to ATEX (for example):			
Ex	**II**	**1**	**G**
Symbol	All areas except mining (mining = I)	Very high safety level suited for zone 0 (two independent means of protection)	Explosion protected against gas, vapour and mist (D = dusts)
Additionally, the year of production and the constructional level of safety must be contained in the device's marking.			

Marking of an associated apparatus acc. to ATEX (for example):					
Ex	**II**	**(**	**1**	**)**	**G**
Symbol	All areas except mining (mining = I)	Associated appartus	Very high safety level suited for zone 0 (two independent means of protection)	Associated appartus	Explosion protected against gas, vapour and mist (D = dusts)

Proof of Intrinsic Safety

According to EN 60079-14 a proof of intrinsic safety must be provided to confirm that the equipment which is interconnected within an assembly accords to the requirements of intrinsic safety.
In this context there is a clear distinction between two basically different circuits:
1. a simple intrinsically safe circuit with a single associated apparatus and at least one intrinsically safe apparatus without additional supply
2. more than one associated apparatus which is capable of supplying electrical energy to the intrinsically safe circuit, not only during normal service but also in a fault condition.

Simple circuit
The first definition of a simple intrinsically safe circuit requires to observe all electrical limit values stated in the type examination certificate and the power characteristics. If these conditions are met, the user is entitled to keep a proof of intrinsic safety. Inductances and capacitances of the installed cables must be taken into account.

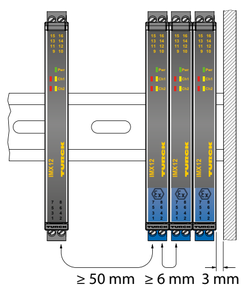
Intrinsic safety of a simple circuit is given, if the following conditions are met (application of the 50 % rule for accumulated reactances):

Associated apparatus	Condition	Intrinsically safe equipment + cable
U_0	≤	U_I
I_0	≤	I_I
P_0	≤	P_I
L_0	≥	$L_I + L_C$
C_0	≥	$C_I + C_C$

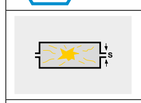
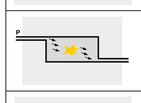
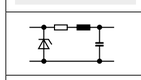
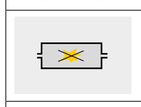
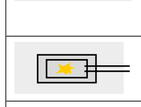
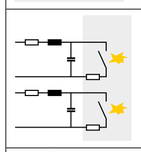
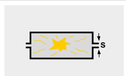
The cable characteristics provided by the manufacturer should be used. Should these not be available, it is recommended to apply the following typical values (acc. to EN 60079-14):
L_C = 1 µH/m (30 µH/Ω)
C_C = 200 pF/m

Connection of proximity switches to isolating switching amplifiers, or 2-wire transmitters to isolating transducers, or solenoid valves to a valve control module can be considered as simple circuits.

General guidelines for the use of devices with intrinsically safe circuits
It is required to observe a safety distance of 3 mm (EN 60079-11) to earthed components, such as covers or side panels of mounting cabinets. A thread measure of 50 mm must be observed between intrinsically safe connections and non-safe connections.

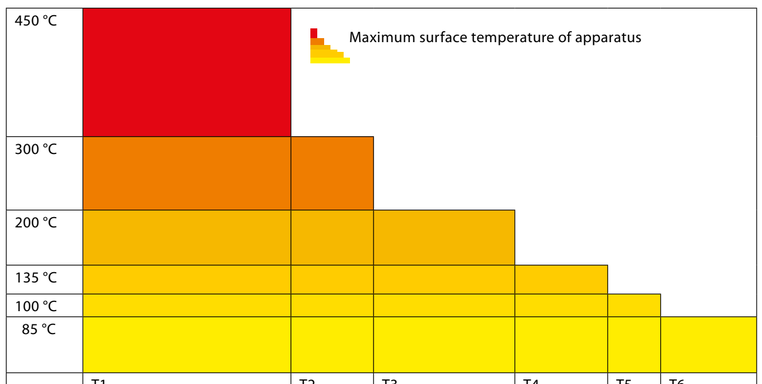


Overview of Ignition Protection Classes

Symbol	Name	Standard	Comments	Zone	
Ex	General requirements	EN 60079-0	EN 60079-0 comprises general regulations on the construction and testing of electrical equipment for use in explosion hazardous areas.		
	Flameproof enclosure (d)	EN 60079-1	In the case of ignition inside the encapsulation, the enclosure must withstand the pressure, and a transfer of the "inner" explosion to the outside must be ruled out.	0 1 2	
	Presurised enclosure (pxb) (pyb) (pzc)	EN 60079-2 EN 61241-4	A protective gas, which is under overpressure, (min 0.5 m bar) encloses and separates the ignition source from the surrounding atmosphere.	1 2	21 22
	Sand filling (q)	EN 60079-5	The finely grained material encloses the ignition source. An electric arc generated in the inside of the housing must not be capable of igniting the potentially explosive atmosphere during proper operation.	1 2	
	Oil immersion (o)	EN 60079-6	Protection type „oil immersion" implies that the electrical apparatus and its components are separated from the potentially explosive atmosphere by immersion in oil.	1 2	
	Increased safety (e)	EN 60079-7	This protection type (e) applies only to electrical equipment and its components which is incapable of generating dangerous sparks, electrical arcs or thermal effects during normal operation. The voltage rating of this type of equipment may not exceed 11 kV.	1 2	
	Intrinsic safety (ia) (ib) (ic)	EN 60079-11	The energy in the circuit is limited to such an extent that sparks, electrical arcs or high temperatures cannot be generated.	0 1 2	20 21 22
	Non sparking apparatus (nA)	EN 60079-15	Sparking is excluded. Clearances and creepage distances are determined. Maximum surface and component temperatures are limited. The protection degree of the housing has to be at least IP54/IP44. Area of application: zone 2.	2	
	Sparking apparatus (nC) (nR)	EN 60079-15	The protection type applies to sparking equipment, in which contacts are appropriately protected by: – enclosed switching device – sealed equipment – hermetically sealed housing – restricted-breathing enclosure Area of application: zone 2.	2	
	Encapsulation (ma) (mb) (mc)	EN 60079-18	Possible ignition sources are encapsulated in a potting material so that they are incapable of igniting an explosive atmosphere.	0 1 2	20 21 22
	Intrinsically safe electrical systems (ia) (ib) (ic)	EN 60079-25	Distinguished are: – certified intrinsically safe systems – non certified intrinsically safe systems An intrinsically safe system is the approved assembly of interconnected electrical equipment (intrinsically safe and associated apparatus). It is documented accordingly in the system description.	0 1 2	20 21 22
	Optical radiation (op is) (op pr) (op sh)	EN 60079-28	The optical radiated power is limited so that it is incapable of igniting an explosive atmosphere.	0 1 2	20 21 22
	Protection by housing (ta) (tb) (tc)	EN 60079-31	The enclosure is so dense that no combustible dust can enter it. The surface temperature of the outer enclosure is limited.		20 21 22

Ignition Temperature and Classification of Combustible Materials According to Groups and Temperature Classes

(I = mining areas susceptible to fire damp II = all other atmospheres)



	T1	T2	T3	T4	T5	T6
I	Methane					
IIA	Aceton, Ammonia, Amyl Acetate, Benzene, Acetic Acid, Ethane, Ethyl acetate, Carbon monoxide, Methane, Methanol, Propane, Toluene	Butane, Butanol, Ethanol	Benzines, Diesel fuel, Hexane			
IIB	Town gas	Ethylene	Hydrogen sulphidef	Diethyl ether		
IIC	Hydrogen	Acetylene				Carbon disulphide

[2]) Application in dust areas

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