

## Marking to Directive 2014/34/EU



Number of the notified body (responsible for quality assurance)
0102 Physikalisch-Technische Bundesanstalt PTB, Germany
0158 DEKRA EXAM GmbH, Germany
0032 TÜV CERT GmbH, Germany
0637 IBEExU, Institut für Sicherheitstechnik, Germany
0344 Dekra Certification B.V., Netherlands
0081 LCIE Laboratoire Central des Industries Electriques, France
0080 INERIS, France
0600 EECs Electrical Equipment Certification Service, Great Britain
0518 SCS Sira Certification Services, Great Britain
0163 LOM, Spain
0470 NEMKO, Norway
0434 Det Norske Veritas AS, Norway
0539 UI International DEMKO, Denmark
1258 Electrosuisse SEV, Switzerland

**Category**  
**Equipment-group II** Explosive atmospheres (other than mines)  
**Equipment-group I** Mines susceptible to firedamp



## Equipment Categories (Directive 2014/34/EU Annex I)

Equipment category 1	Equipment category 1 comprises equipment designed to be capable of functioning in conformity with the operational parameters established by the manufacturer and ensuring a very high level of protection. Equipment in this category is intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours or mist or by air/dust mixtures are present continuously, for long periods or frequently. Equipment in this category must ensure the requisite level of protection, even in the event of rare incidents relating to equipment, and is characterised by means of protection such that: <ul style="list-style-type: none"> <li>- either, in the event of failure of one means of protection, at least an independent second means provides the requisite level of protection,</li> <li>- or the requisite level of protection is assured in the event of two faults occurring</li> </ul>
Equipment category 2	Equipment category 2 comprises equipment designed to be capable of functioning in conformity with the operational parameters established by the manufacturer and of ensuring a high level of protection. Equipment in this category is intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally. <p>The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account.</p>
Equipment category 3	Equipment category 3 comprises equipment designed to be capable of functioning in conformity with the operating parameters established by the manufacturer and ensuring normal level of protection. Equipment in this category is intended for use in areas in which explosive atmospheres caused by gases, vapours, mists, or air/dust mixtures are unlikely to occur or, if they do so only infrequently and for a short period only.

## Classifications of Locations (NEC 500.5)

Locations shall be classified depending on the properties of the flammable gas, flammable liquid-produced vapor, combustible-liquid produced vapors, combustible dusts, or fibers/flyings that may be present, and the likelihood that a flammable or combustible concentration or quantity is present. Each room, section, or area shall be considered individually in determining its classification.

Class	Division	Description	Group
Class I	Division 1	In which ignitable concentrations of such flammable gases, flammable liquid-produced vapors, or combustible liquid-produced vapors can exist under normal operating conditions.	Group A Acetylene Group B Hydrogen Group C Ethylene Group D Propane
	Division 2	In which volatile flammable gases, flammable liquid-produced vapors, or combustible liquid-produced vapors are handled, processed, or used, but in which the liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems or in case of abnormal operation of equipment.	
Class II	Division 1	In which combustible dust is in the air under normal operating conditions in quantities sufficient to produce explosive or ignitable mixtures.	Group E Metal Dust Group F Coal Dust Group G Grain Dust
	Division 2	In which combustible dust due to abnormal operations may be present in the air in quantities sufficient to produce explosive or ignitable mixtures.	
Class III	Division1	In which easily ignitable fibers/flyings are handled, manufactured, or used.	Fibres
	Division2	In which easily ignitable fibers/flyings are stored or handled other than in the process of manufacture.	

## Marking to Standard IEC 60079-0

### Gas



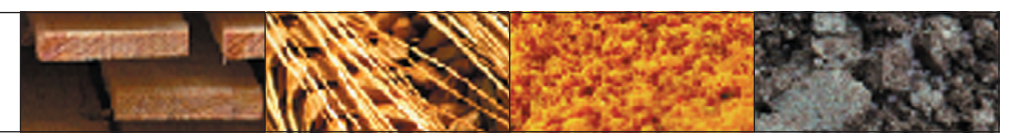
### Electrical apparatus for explosive gas atmospheres (Equipment-group II [chemicals])

EPL	Standards	Type of protection
	IEC 60079-0	General requirements
Ga	IEC 60079-1	da Equipment protection by flameproof enclosures «d»
	IEC 60079-11	ia Equipment protection by intrinsic safety «i»
	IEC 60079-18	ma Equipment protection by encapsulation «m»
	IEC 60079-26	Equipment with equipment protection level (EPL) Ga
Gb	IEC 60079-28	op is Protection of equipment and transmission systems using optical radiation
	IEC 60079-1	d, db Equipment protection by flameproof enclosures «d»
	IEC 60079-2	p, pxb, pyb Equipment protection by pressurized enclosure «p»
	IEC 60079-5	q Equipment protection by powder filling «q»
Gc	IEC 60079-6	ob Equipment protection by liquid immersion «o»
	IEC 60079-7	e, eb Equipment protection by increased safety «e»
	IEC 60079-11	ib Equipment protection by intrinsic safety «i»
	IEC 60079-18	mb Equipment protection by encapsulation «m»
	IEC 60079-25	Intrinsically safe electrical systems
	IEC 60079-28	op is, op pr, op sh Protection of equipment and transmission systems using optical radiation
	IEC 60079-1	dc Equipment protection by flameproof enclosures «d»
	IEC 60079-2	pzc Equipment protection by pressurized enclosure «p»
	IEC 60079-6	oc Equipment protection by liquid immersion «o»
	IEC 60079-7	ec Equipment protection by increased safety «e»
Gc	IEC 60079-11	ic Equipment protection by intrinsic safety «i»
	IEC 60079-18	mc Equipment protection by encapsulation «m»
	IEC 60079-15	nA Equipment protection by type of protection «n» – «non sparking»
	IEC 60079-15	nR Equipment protection by type of protection «n» – «restricted breathing»
	IEC 60079-15	nL Equipment protection by type of protection «n» – «limited energy»
	IEC 60079-15	nC Equipment protection by type of protection «n» – enclosed-break device
IEC 60079-28	op is, op pr, op sh Protection of equipment and transmission systems using optical radiation	

## Ex db eb IIC T5 Gb

Group II (Gas)	Temperature class	Ignition temperature of gas or vapour	Maximum admissible surface temperature for permanently hot surfaces	Zone	Equipment Protection Level (EPL)
IIA Aceton, ethane, Benzene, petrol, butane, propane, methane	T1	> 450 °C	440 °C	0	Ga
	T2	> 300 °C	290 °C	1	Gb and Ga
	T3	> 200 °C	195 °C	2	Gc, Gb and Ga
IIB Ethylene, town gas	T4	> 135 °C	130 °C		
	T5	> 100 °C	95 °C		
IIC Hydrogen, acetylene	T6	> 85 °C	80 °C		

### Dust



### Electrical equipment for use in areas with combustible dust (Equipment-group III)

EPL	Standards	Type of protection
	IEC 60079-0	General requirements
Da	IEC 60079-11	ia Equipment protection by intrinsic safety «i»
	IEC 60079-18	ma Equipment protection by encapsulation «m»
	IEC 60079-31	ta Equipment dust ignition protection by enclosure «t»
Db	IEC 60079-2	pxb Equipment protection by pressurized enclosure «p»
	IEC 60079-11	ib Equipment protection by intrinsic safety «i»
	IEC 60079-18	mb Equipment protection by encapsulation «m»
	IEC 60079-31	tb Equipment dust ignition protection by enclosure «t»
Dc	IEC 60079-2	pzc Equipment protection by pressurized enclosure «p»
	IEC 60079-11	ic Equipment protection by intrinsic safety «i»
	IEC 60079-18	mc Equipment protection by encapsulation «m»
	IEC 60079-31	tc Equipment dust ignition protection by enclosure «t»

Surface temperature max.

## Ex tb IIIC T95°C Db

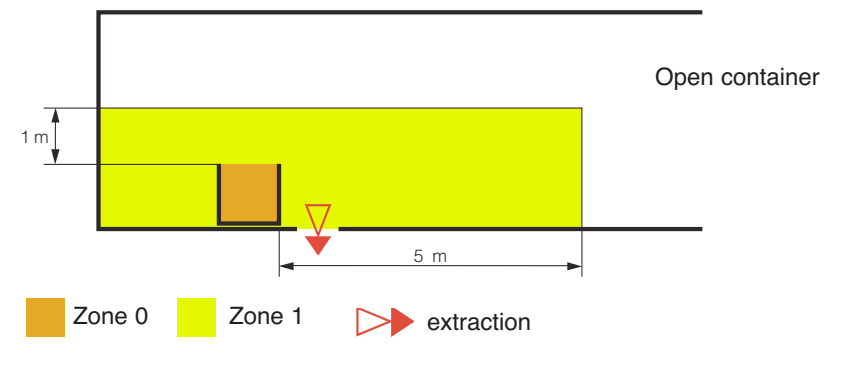
Group III (Dust)	Zone	Equipment Protection Level (EPL)
IIIA fibres	20	Da
IIIB non-conductive dust	21	Db and Da
IIC conductive dust	22	Dc, Db and Da

## Zone Classification, Installation, Inspection, Maintenance, Repair and Overhaul

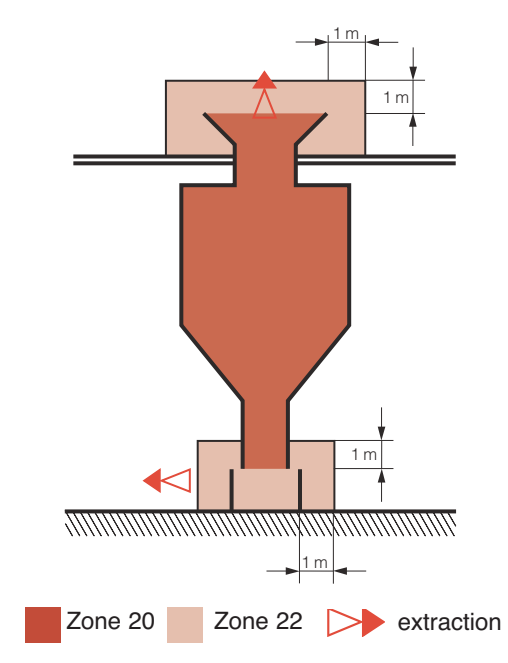
Standards	Description
IEC 60079-10-1	Classification of areas – Explosive gas atmospheres
IEC 60079-10-2	Classification of areas – Combustible dust atmospheres
IEC 60079-14	Electrical installations design, selection and erection
IEC 60079-17	Electrical installations inspection and maintenance
IEC 60079-19	Equipment repair, overhaul and reclamation

Zone	Description
Zone 0	A place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas or vapour is present continuously or for long periods or frequently.
Zone 1	A place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas or vapour is likely to occur in normal operation occasionally.
Zone 2	A place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas or vapour is not likely to occur in normal operation, but if it does occur, will persist for a short period only (usually no longer than 2 hours).

**Classification of areas**  
 Filling (e.g. filling station, transfer by pumping)  
 Mixing installation (e.g. stirring, mixing)

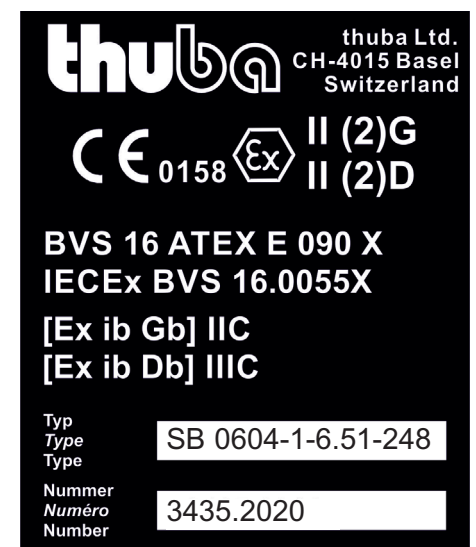


**Classification of areas**  
 Filling (e.g. filling openings) and emptying (e.g. bagging stations) without deposits



Dust	Description
Zone 20	Area in which an explosive atmosphere in the form of a cloud of combustible dust in air is present continuously or for long periods or frequently.
Zone 21	Area in which an explosive atmosphere in the form of a cloud of combustible dust in air is likely to occur, occasionally, in normal operation.
Zone 22	Area in which an explosive atmosphere in the form of a cloud of combustible dust in air is not likely to occur in normal operation, but if it does occur, will persist for a short period only.

Directive 1999/92/EC	IEC	NEC 505	NEC 500
Zone 0 / 20	Zone 0 / 20	Zone 0 / 20	Division 1
Zone 1 / 21	Zone 1 / 21	Zone 1 / 21	
Zone 2 / 22	Zone 2 / 22	Zone 2 / 22	Division 2



**Associated apparatus**  
 must not be installed in potentially explosive atmospheres (no temperature class)  
 Examples  
 - Transmitter power supply  
 - Disconnect amplifiers  
 - Zener barriers  
 - Interface

### Non-electrical equipment for use in potentially explosive atmospheres

Standards	Type of protection	
EN ISO 80079-36 EN 13463-1*	h	Basic method and requirements
EN ISO 80079-37 EN 13463-5* EN 13463-6* EN 13463-8*		Non-electrical type of protection constructional safety «c» Non-electrical type of protection control of ignition sources «b» Non-electrical type of protection liquid immersion «k»
EN 60079-1		d Equipment protection by flameproof enclosures «d»
EN 60079-2	p	Equipment protection by pressurized enclosure «p»

\* valid until October 31, 2019

Example Marking  
 Ex h IIC T4 Gb  
 Ex h IIIC T130°C Db

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## Electrostatic Charges

### Gas (extract IEC 60079-0)

The requirements regarding electrostatic charges must be met with one of the following measures:  
 a) by suitable selection of the material to keep the surface resistance of the enclosure from exceeding 10<sup>9</sup> Ohm (tested according IEC 60079-0, part 26.13)  
 b) by limitation of the surface area of enclosures and enclosure parts of plastics (projected in any direction), the layer thickness of plastic sheets, and the width or diameter of long insulating parts.

Category	EPL	Surfaces [mm²]		
		IIA	IIB	IIC
1 G	Ga	5000	2500	400
2 G	Gb	10000	10000	2000
3 G	Gc	10000	10000	2000

Table 1: Limitation of the surfaces

Category	EPL	Layer thickness [mm]		
		IIA	IIB	IIC
1 G	Ga	2	2	0.2
2 G	Gb	2	2	0.2
3 G	Gc	2	2	0.2

Table 2: Maximum admissible layer thicknesses

Category	EPL	Width or diameter		
		IIA	IIB	IIC
1 G	Ga	3	3	1
2 G	Gb	30	30	20
3 G	Gc	30	30	20

Table 3: Maximum admissible width or diameter of long insulating parts

### Dust (extract IEC 60079-0)

Electrostatic charging of enclosures or enclosure parts of plastics must be limited. Equipment must be designed so that, under normal operating conditions, the danger of ignition as a result of brush discharges will be avoided.

- This can be achieved by using plastics that have at least one of the following characteristics:
- Surface resistance < 10<sup>9</sup> Ohm (resistance to electrostatic discharge to earth through an insulating material or along its surface; tested according IEC 60079-0, part 26.13)
  - Breakdown voltage ≤ 4 kV (measured through the thickness of the insulating material with the method described in IEC 60243-1)
  - A thickness ≥ 8 mm of the external insulation on metal parts.
  - by marking the 'X' in accordance with the item e) of 29.3. This is only applicable to electrical equipment intended for fixed installations where the installation is intended to minimize the risk from electrostatic discharge. The instructions shall provide guidance for the user to minimize the risk from electrostatic discharge.

## Resistance to impact

### IEC 60079-0 (Clause 26.4.2)

0,7 m*	(0,4 m* marked with the symbol 'X') Enclosures and external accessible parts of enclosures (other than light-transmitting parts)
0,7 m*	(0,4 m* marked with the symbol 'X') Guards, protective covers, fan hoods, cable glands
0,4 m*	(0,2 m* marked with the symbol 'X') Light-transmitting parts without guard
0,2 m*	(0,1 m* marked with the symbol 'X') Light-transmitting parts with guard having individual openings from 625 mm² to 2500 mm²: see 21.1 (tested without guard)

\* drop height h with a mass of 1 kg  
 The test must be carried out at an ambient temperature of (20±5) °C, except where the material data indicate a reduction of the impact strength at lower temperatures within the prescribed ambient temperature range. In this case the test must be carried out between 5 K and 10 K below the lowest temperature of the prescribed range.

## IP Degree of Protection

### IEC 60529 Degrees of protection provided by enclosures (IP-Code)

IP Code	First numeral (against penetration of solid foreign objects / prevention of access to hazardous parts)	Second numeral (against penetration of water with harmful effects)
0	not protected	not protected
1	≥ 50.0 mm diameter / back of hand	vertically falling water drops
2	≥ 12.5 mm diameter / finger	water drops (enclosure tilted 15°)
3	≥ 2.5 mm diameter / tool	spraying water
4	≥ 1.0 mm diameter / wire	splashing water
5	dust-protected / wire	water jets
6	dust-tight / wire	powerful water jets
7		temporary immersion in water
8		continuous immersion in water

Example: IP 54 dust-protected / protected against splashing water

