

EXPLOSIVE ATMOSPHERES | TECHNICAL GUIDE



DEGREE OF PROTECTION (IP) FIRST NUMERAL IEC 60529

IP	DESCRIPTION
0	Not protected
1	Protected against access to hazardous parts with the back of the hand, solid foreign objects of Ø 50 mm and greater.
2	Protected against access to hazardous parts with a finger, solid foreign objects of Ø 12 mm and greater.
3	Protected against access to hazardous parts with a tool, solid foreign objects of Ø 2.5 mm.
4	Protected against access to hazardous parts with a wire, solid foreign objects of Ø 1.0 mm.
5	Dust-protected, ingress of dust is not totally prevented, but dust cannot enter in a quantity that would interfere with equipment operation or impair its safety.
6	Dust-tight, no ingress of dust is permitted.

DEGREE OF PROTECTION (IP) SECOND NUMERAL IEC 60529

IP	DESCRIPTION
0	Not protected.
1	Protected against vertically falling water drops.
2	Protected against vertically falling water drops when the enclosure is tilted up to 15°.
3	Protected against spraying water (water sprayed at an angle of 60° on either side of the vertical against the enclosure).
4	Protected against splashing water.
5	Protected against water jets.
6	Protected against powerful water jets.
7	Protected against the effects of temporary immersion in water.
8	Protected against the effects of continuous immersion in water.
9	Protected against high-pressure and high-temperature water jets.

EPL PROTECTION LEVEL (EQUIPMENT PROTECTION LEVEL)

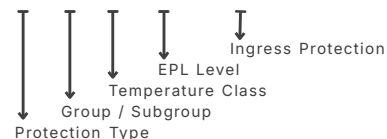
EPL Ga / Da	EPL Gb / Db	EPL Gc / Dc
Equipment with a "very high" level of protection, which does not become a source of ignition in normal operation or during expected malfunctions, or during rare malfunctions. Equipment safe considering up to 2 faults.	Equipment with a "high" level of protection, which does not become a source of ignition in normal operation or during expected malfunctions. Equipment safe considering only 1 fault.	Equipment having an "enhanced" level of protection, which is not a source of ignition in normal operation and which may have some additional protection to ensure that it remains inactive as an ignition source in the case of regular expected occurrences. Equipment safe under normal conditions.

PROTECTION TYPE FOR COMBUSTIBLE DUSTS: ELECTRICAL EQUIPMENT

PROTECTION TYPE	SYMBOL	CATEGORY ATEX	EPL	STANDARD (ABNT NBR IEC)	DESCRIPTION
INTRINSICALLY SAFE	i			60079-11	Limits the energy of sparks and hot surfaces.
ENCAPSULATION	m	1, 2 & 3	Da Db Dc	60079-18	Exclusion, keeps combustible dust out of contact with sparks or hot surfaces.
PROTECTION BY ENCLOSURE	t			60079-31	
PRESSURIZED	p	2 & 3	Db, Dc	60079-2	

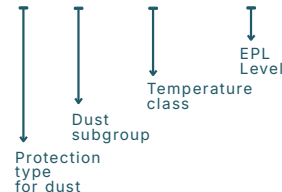
MARKING EXAMPLE FOR FLAMMABLE GASES, VAPORS AND MISTS:

Ex db IIB T4 Gb IP66



MARKING EXAMPLE FOR COMBUSTIBLE DUSTS:

Ex tb IIB T120 °C Db



STANDARDS FOR DESIGN AND INSTALLATION IN EXPLOSIVE ATMOSPHERES

TOPIC	ABNT STANDARD
Area classification - Flammable gases, vapors and mists.	IEC 60079-10-1
Area classification - Combustible dusts.	IEC 60079-10-2
Installation of electrical equipment.	IEC 60079-14
Inspection and maintenance of electrical equipment.	IEC 60079-17
Repair workshop for electrical equipment.	IEC 60079-19
Material characteristics Gases, vapors and mists.	ISO/IEC 80079-20-1
Material characteristics Combustible dusts.	ISO/IEC 80079-20-2

GROUPS/CLASSES

IEC	NEC	DESCRIPTION OF THE ATMOSPHERE
Group I	/	Mines with methane gas (firedamp)
Group IIC	Class I - Group A Class I - Group B	Acetylene gas Hydrogen gas
Group IIB	Class I - Group C	Ethylene gas
Group IIA	Class I - Group D	Propane gas
Group IIIC	Class II - Group F	Conductive dusts
Group IIIB	Class II - Group E	Non-conductive dusts
/	Class II - Group G	Grain dusts
Group IIIA	Class III	Combustible fibers

ZONES/DIVISIONS

EPL	IEC	NEC	FREQUENCY OF THE EXPLOSIVE ATMOSPHERE
Ga / Da	ZONE 0 / 20	Division 1	Continuously present
Gb / Db	ZONE 1 / 21		Likely to occur in normal operation
Gc / Dc	ZONE 2 / 22	Division 2	Not likely to occur in normal operation, only for a short period of time

PROTECTION TYPE FOR GASES, VAPORS AND MISTS

PROTECTION TYPE	SYMBOL	CATEGORY ATEX	EPL	STANDARD (ABNT NBR IEC)	DESCRIPTION
INCREASED SAFETY NON-SPARKING COMPONENTS	e nC	2 & 3 3	Gb, Gc Gc	60079-7 60079-15	Does not generate arcs, sparks or hot surfaces
FLAMEPROOF	d	1, 2 & 3	Ga, Gb, Gc	60079-1	Contains an explosion, prevents propagation
INTRINSICALLY SAFE OPTICAL RADIATION	i op	1, 2 & 3 1, 2 & 3	Ga, Gb, Gc Ga, Gb, Gc	60079-11 60079-28	Limits the energy of sparks and hot surfaces
PRESSURIZED RESTRICTED BREATHING ENCAPSULATION OIL IMMERSION SEALED DEVICES POWDER FILLING	p nR m o nC q	2 & 3 3 1, 2 & 3 2 & 3 2 & 3	Gb, Gc Gc Ga, Gb, Gc Gb, Gc Gb, Gc	60079-2 60079-15 60079-18 60079-6 60079-15 60079-5	Exclusion, keeps flammable gas out of contact with sparks or hot surfaces
SPECIAL	s	1, 2 & 3	Ga, Gb, Gc	60079-33	Risk assessment

PROTECTION TYPES FOR GASES, VAPORS AND MISTS: NON-ELECTRICAL

PROTECTION TYPE	SYMBOL	CATEGORY ATEX	STANDARD (ABNT NBR ISO/IEC)	BASIC PROTECTION CONCEPT
GENERAL REQUIREMENTS	/	/	80079-36	/
CONSTRUCTIONAL SAFETY	c	2	80079-37	Ignition sources cannot arise.
LIQUID IMMERSION	k	2	80079-37	Keeps flammable gas out of contact.
FLAMEPROOF ENCLOSURE	d	2	/	Contains the explosion, prevents propagation
CONTROL OF IGNITION SOURCES	b	2	80079-37	Ignition sources cannot become active.

TEMPERATURE CLASS

TEMP. CODE NEC 500	TEMP. CLASS NEC 505/IEC	MAXIMUM SURFACE TEMP. (EQUIPMENT)	PERMITTED TEMP. CLASSES (EQUIPMENT)
T1	T1	450°C	T1 to T6
T2	T2	300°C	T2 to T6
T2A	/	280°C	T2A to T6
T2B	/	260°C	T2B to T6
T2C	/	230°C	T2C to T6
T2D	/	215°C	T2D to T6
T3	T3	200°C	T3 to T6
T3A	/	180°C	T3A to T6
T3B	/	165°C	T3B to T6
T3C	/	160°C	T3C to T6
T4	T4	135°C	T4 to T6
T4A	/	120°C	T4A to T6
T5	T5	100°C	T5 to T6
T6	T6	85°C	T6

WHAT IS NEEDED TO HAVE AN EXPLOSION IN ATMOSPHERES WITH FLAMMABLE GASES, VAPORS AND MISTS?



WHAT IS NEEDED TO HAVE AN EXPLOSION IN ATMOSPHERES WITH COMBUSTIBLE DUSTS?

