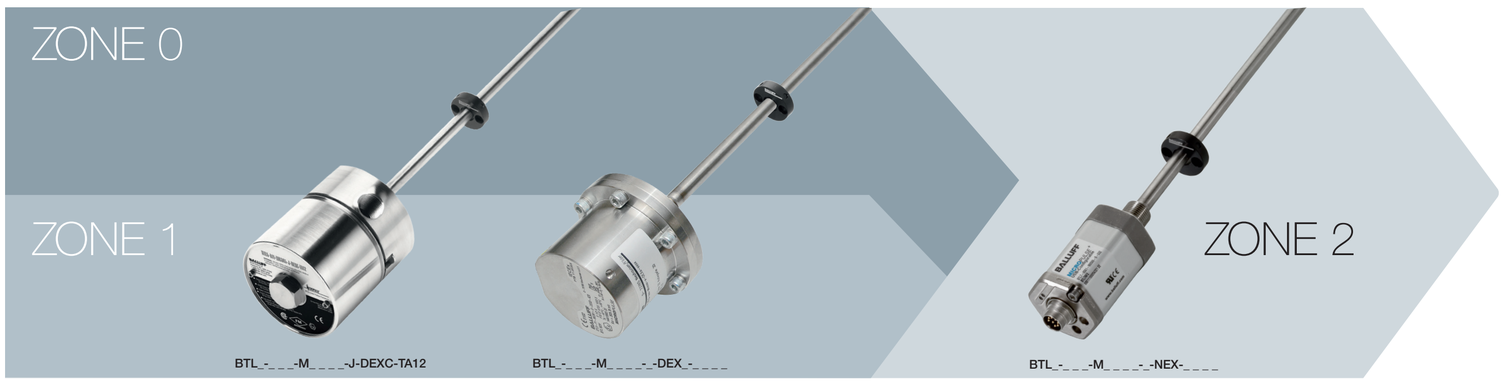
WE PROVIDE POSITION FEEDBACK AND SENSORS FOR HAZARDOUS AREAS

innovating automation



Explanation of Markings

ATEX

Marking according to EU directive 2014/34/EU (ATEX)

Gas II 1/2G
1 2a
Dust II 1/2D
1 2b

IECEx

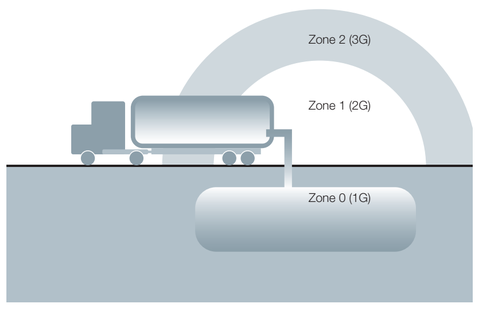
Marking according to EN 60079 and IEC 60079

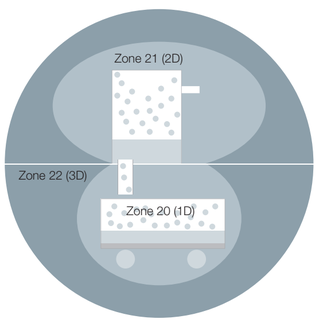
Ex db IIC T6/T5 Ga/Gb Ta +65 °C (T6) + 80 °C (T5)
3 4 5a 6a 7 9
Ex tb IIIC T85/T100 °C Da IP68 Ta +65 °C (T85) + 80 °C (T100)
3 4 5b 6b 7 8 9

NEC

Marking according to NEC 500 (US)/CEC Annex J (CA)

Class I Division 1 Groups ABCD T5/T6
10 11 12 13
Class II Division 1 Groups EFG T5/T6
10 11 12 13
Class III Enclosure Type 4X/6P
10 14
Ambient Temperature Range: –40...+65 °C (T6) or –40...+80 °C (T5)

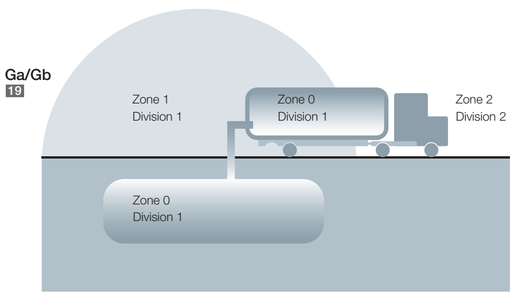




1 Equipment Group
2a Equipment Category Gas (/= marking of a device with two categories)
2b Equipment Category Dust
3 Ex for Electrical Apparatus
4 Type of Protection
5a Explosion Group Gas
5b Explosion Group Dust
6a Temperature Class (Gas)
6b Max. Surface Temperature (Dust)
7 EPL-Equipment Protection Level
8 IP-Code
9 Max. Ambient Temperature

Class I Zone 1 AEx d IIC T5/T6 Ga/Gb
10 15 16 17 18 13 19

10 Hazard Class
11 Permitted Division
12 Permitted Group
13 Temperature Class
14 U.S. Enclosure Type
15 Permitted Zone
16 A = American National Standard
Ex = Explosion Protected
17 Type of Protection
18 Explosion Group
19 EPL-Equipment Protection Level



Equipment Group	I-Mines	II – Other Places 2a 2b					
Explosive atmosphere		Continuously, for a long period frequently		Occasionally		Rarely and for a short period	
Hazardous places		Zone 0	Zone 20	Zone 1	Zone 21	Zone 2	Zone 22
Equipment category	M1 or M2	1G	1D	2G	2D	3G	3D
EPL (IEC/EN 60079-0)	Ma or Mb	Ga	Da	Gb	Db	Gc	Dc

1 Equipment Group	Definition
I	Equipment group I applies to equipment intended for use in underground parts of mines, and to those parts of surface installations of such mines, liable to be endangered by firedamp and/or combustible dust.
II	Equipment group II applies to equipment intended for use in other places liable to be endangered by explosive atmospheres.

Zone	Definition
Zone 0	A place in which a hazardous explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapor or mist is present continuously or for long periods or frequently.
Zone 1	A place in which an explosive atmosphere consisting of a mixture of air with flammable substances in the form of gas, vapour or mist is likely to occur in normal operation occasionally.
Zone 2	A place in which an explosive atmosphere consisting of a mixture of air with flammable substances in the form of gas, vapour or mist is not likely to occur in normal operation but, if it does occur, will persist for a short period only.
Zone 20	A place in which an explosive atmosphere in the form of a cloud of combustable dust in air is present continously, or for long periods or frequently.
Zone 21	A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is likely to occur in normal operation occasionally.
Zone 22	A place 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.

Applications

Position feedback

Level monitoring

Detect end-of-travel positions

For further information about products with Ex certificates please refer to www.balluff.com/sensors-with-ex-certificates

4 Protection Type for Electrical Apparatus						
Type of Protection	Symbol	Symbol Alternative	EPL 7	For Zone	Standard	Definition
Increased safety	e	eb ec	Gb Gc	1 2	EN 60079-7	Additional measures are applied to prevent the possibility of inadmissibly high temperatures and the occurrence of sparks or electric arcs within the enclosure or on exposed parts of electrical equipment, where such ignition sources would not occur in normal service.
Flameproof enclosures Balluff **DEX**	d	da db dc	Ga Gb Gc	0 1 2	EN 60079-1	Parts which can ignite a potentially explosive atmosphere are surrounded by an enclosure which withstands the pressure of an explosive mixture exploding inside the enclosure and prevents the transmission of the explosion to the atmosphere surrounding the enclosure.
Pressurized enclosures	px py pz	pxb pyb pzc	Gb, Db Gb, Db Gc, Dc	1, 21 1, 21 2, 22	EN 60079-2	The formation of a potentially explosive atmosphere inside an enclosure is prevented by maintaining a positive internal pressure of protective gas in relation to the surrounding atmosphere and by supplying the inside of the enclosure with a constant flow of protective gas which dilutes any combustible mixtures.
Intrinsic safety Balluff **EEX**	i	ia ib ic	Ga, Da Gb, Db Gc, Dc	0, 20 1, 21 2, 22	EN 60079-11	Equipment only contains intrinsically safe electric circuits. An electric circuit is intrinsically safe if any spark or thermal effect produced under normal operation is not capable of causing ignition of a given explosive atmosphere.
Oil immersion	o	ob oc	Gb Gc	1 2	EN 60079-6	Equipment are immersed in a protective fluid (e. g. oil) in such a way that a potentially explosive atmosphere existing above the surface or outside of the encapsulation cannot be ignited.
Powder filling	q	qb qc	Gb Gc	1 2	EN 60079-5	Filling the enclosure with a fine grained packing material has the effect of making it impossible for an electric arc created in the enclosure under normal operating conditions to ignite a potentially explosive atmosphere surrounding the enclosure. Ignition must neither be caused by flames nor by elevated temperatures on the enclosure surface.
Encapsulation	m	ma mb mc	Ga, Da Gb, Db Gc, Dc	0, 20 1, 21 2, 22	EN 60079-18	Parts that are capable of igniting an explosive atmosphere are enclosed in a compound in such a way that ignition of an explosive atmosphere is prevented.
Type of protection „n" Non-sparking Balluff **NEX**	nA	nAc	Gc	2	EN 60079-15	Additional measures are applied to prevent the occurrence of sparks or electric arcs within the enclosure, where such ignition sources would not occur in normal service.
Spark-proof Restricted breathing	nC nR	nCc nRc	Gc Gc	2 2		
Protection by enclosures IPXX	ta tb tc		Da Db Dc	20 21 22	EN 60079-31	Tightness of the enclosure prevents ingress of dust or limits it to a nonhazardous amount. The surface temperature of the enclosure must not ignite the surrounding atmosphere.

5a Explosion Groups				
Gas				
IIA	IIB	IIC	Ignition Temperature	Temperature Class
Ammonia, methane, ethane, propane	Town gas, acrylonitrile	Hydrogen	> 450 °C	T1...T6
Ethanol, cyclohexane, n-butane	Ethylene, ethylene oxide	Acetylene	> 300...450 °C	T2...T6
Gasoline, kerosene, n-hexane	Ethylene glycol, hydrogen sulfide		> 200...300 °C	T3...T6
Acetic aldehyde	Ethyl ether		> 135...200 °C	T4...T6
			> 100...135 °C	T5...T6
		Carbon disulfide	> 85...135 °C	T6...T6

6a Ignition Temperature of Gases and Vapors	Max. Surface Temperature on the Equipment	Temperature Class
> 450 °C	450 °C	T1
> 300...450 °C	300 °C	T2
> 200...300 °C	200 °C	T3
> 135...200 °C	135 °C	T4
> 100...135 °C	100 °C	T5
> 85...135 °C	85 °C	T6

5b Explosion Groups				
Dust				
IIIA	IIIB	IIIC	Ignition Temperature	Temperature Class
Combustible flyings	Non-conductive dust	Conductive dust	Surface temperature is specified directly	Non

11 15 Area Classification			
	Flammable Material/ Present Continously	Flammable Material/ Present Intermittently	Flammable Material/ Present Abnormally
NEC 505 (US)	Zone 0	Zone 1	Zone 2
NEC 500 (US)	Division 1		Division 2
CEC Section 18 (CA)	Zone 0	Zone 1	Zone 2
CEC Annex J (CA)	Division 1		Division 2

US classification per ANSI/NFPA 70 National Electrical Code (NEC) Article 500 or Article 505
CA classification per CSA C22.1 Canadian Electrical Code (CEC) Section 18 or Annex J

16 17 Type of Protection	Code	Country	Application	Protection Principle	Standard
General requirements		US	Class I, Division 1 and 2		FM 3600
		CA	Class I, Division 1 and 2		CSA C22.2 No. 0
	AEx	US	Class I, Division 1 and 2		ISA 60079-0
	Ex	CA	Class I, Division 1 and 2		CSA C22.2 No. 60079-0
Increased safety	AEx e (or AEx eb)	US	Class I, Zone 1		ISA 60079-7
	Ex e	CA	Class I, Zone 1		CSA C22.2 No. 60079-7
Non-incendive	(NI)	US	Class I, Division 2	No arcs, sparks or hot surfaces	FM 3611
	(NI)	CA	Class I, Division 2		CSA C22.2 No. 213
Non-sparking	AEx nA (or AEx nAc)	US	Class I, Zone 2		ISA 60079-15
	Ex nA	CA	Class I, Zone 2		CSA C22.2 No. 60079-15
Explosionproof	(XP)	US	Class I, Division 1		FM 3615
	(XP)	CA	Class I, Division 1		CSA C22.2 No. 30
Flameproof	AEx d (or AEx db)	US	Class I, Zone 1		ISA 60079-1
	Ex d	CA	Class I, Zone 1		CSA C22.2 No. 60079-1
Powder-filled	AEx q (or AEx qb)	US	Class I, Zone 1	Contain the explosion and extinguish the flame	ISA 60079-5
	Ex q	CA	Class I, Zone 1		CSA C22.2 No. 60079-5
Enclosed break	AEx nC (or AEx nCc)	US	Class I, Zone 2		ISA 60079-15
	Ex nC	CA	Class I, Zone 2		CSA C22.2 No. 60079-15
Intrinsic safety	(I.S.)	US	Class I, Division 1		FM 3610
	(I.S.)	CA	Class I, Division 1		CSA C22.2 No.157
	AEx ia	US	Class I, Zone 0		FM 3610
	Ex ia	CA	Class I, Zone 0		CSA C22.2 No. 60079-11
	AEx ib	US	Class I, Zone 1		FM 3610
	Ex ib	CA	Class I, Zone 1	Limit energy of sparks and surface temperature	CSA C22.2 No. 60079-11
	AEx ic	US	Class I, Zone 2		FM 3610
	Ex ic	CA	Class I, Zone 2		CSA C22.2 No. 60079-11
Limited energy	AEx nC (or AEx nCc)	US	Class I, Zone 2		ISA 60079-15
	Ex nL	CA	Class I, Zone 2		CSA C22.2 No. 60079-15
Pressurized	Type X	US	Class I, Division 1		FM 3620 (NFPA 496)
	Type X	CA	Class I, Division 1		NFPA 496
	Type Y	US	Class I, Division 1		FM 3620 (NFPA 496)
	Type Y	CA	Class I, Division 1		NFPA 496
	Type Z	US	Class I, Division 2		FM 3620 (NFPA 496)
	Type Z	CA	Class I, Division 2		NFPA 496
	AEx px (or AEx pxb)	US	Class I, Zone 1		ISA 60079-2
	Ex px	CA	Class I, Zone 1		CSA C22.2 No. 60079-2
	AEx py (or AEx pyb)	US	Class I, Zone 1		ISA 60079-2
	Ex py	CA	Class I, Zone 1		CSA C22.2 No. 60079-2
	AEx pz (or AEx pzc)	US	Class I, Zone 2		ISA 60079-2
	Ex pz	CA	Class I, Zone 2		CSA C22.2 No. 60079-2
Restricted breathing	AEx nR (or AEx nRc)	US	Class I, Zone 2	Keep flammable gas out	ISA 60079-15
	Ex nR	CA	Class I, Zone 2		CSA C22.2 No. 60079-15
Encapsulation	AEx ma	US	Class I, Zone 0		ISA 60079-18
	Ex ma	CA	Class I, Zone 1		CSA C22.2 No. 60079-18
	AEx m	US	Class I, Zone 1		ISA 60079-18
	AEx mb	US	Class I, Zone 1		ISA 60079-18
	Ex mb	CA	Class I, Zone 1		CSA C22.2 No. 60079-18
	AEx mc	US	Class I, Zone 2		ISA 60079-18
	Ex mc	CA	Class I, Zone 2		CSA C22.2 No. 60079-18
Liquid immersion	AEx o (or AEx ob)	US	Class I, Zone 1		ISA 60079-6
	Ex o	CA	Class I, Zone 1		CSA C22.2 No. 60079-6

Group			
Substance	Hazard Class 10	NEC 500 12	NEC 505 18
Acetylene	Class I	Group A	IIC
Hydrogen		Group B	IIC
Ethylene		Group C	IIB
Propane		Group D	IIA
Methane (mining)		Group D	
Metal (conductive) dust	Class II	Group E	
Coal (carbonaceous) dust		Group F	
Grain dust		Group G	
Combustible fibers and flyings	Class III, fibers and flyings		

13 Temperature Classes		
NEC 505 (US)	NEC 500 (US)	Max. Surface Temperature 6b
T1	T1	450 °C
T2	T2	300 °C
	T2A	280 °C
	T2B	260 °C
	T2C	230 °C
	T2D	215 °C
T3	T3	200 °C
	T3A	180 °C
	T3B	165 °C
	T3C	160 °C
T4	T4	135 °C
	T4A	120 °C
T5	T5	100 °C
T6	T6	85 °C

Balluff GmbH · Schurwaldstrasse 9 · 73765 Neuhausen a.d.F. · Germany
Phone +49 7158 173-0 · Fax +49 7158 5010 · balluff@balluff.de · www.balluff.com

Doc. No. 922419/Mat. · K18 · Subject to modification · Replaces E16.