Hazardous Location Guide

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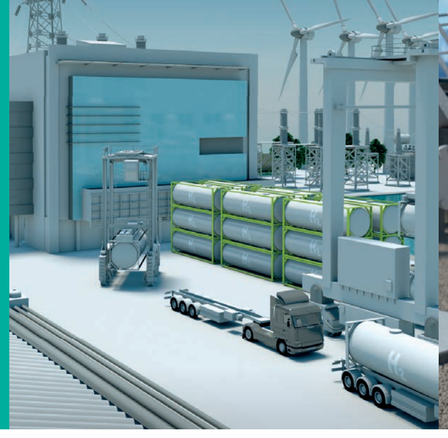



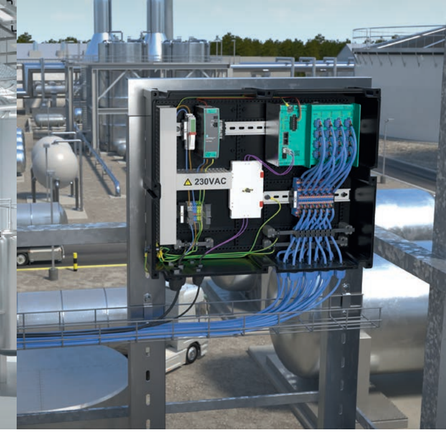

Example Equipment Markings

1

c UL us

Class I, Division 1, Grps. A, B, C, D, T4 — A
Class I, Zone 1, Grp. IIC, T4 — B
-20 °C ≤ Ta ≤ 60 °C
Class II, Division 1, Grps. E, F, G, T60 °C — A
Zone 21, Grp. IIIC T60 °C — B
-20 °C ≤ Ta ≤ 50 °C
[Ex i] Associated equipment/material
Refer to installation drawing 116-B027A

H I
IP66 / Type 4X
Y Z
Degree of Protection
(Ingress Protection)

2

C D
Class I, Zone 1 AEx db ib [ib Gb] [pxb Gb] IIC T4 Gb (-20 °C ≤ Ta ≤ 60 °C)
Zone 21 AEx ib tb [ib Db] [pxb Db] IIIC T60 °C Db (-20 °C ≤ Ta ≤ 50 °C)
C E

3

F D
Ex CE 0539
II 2 G Ex db ib [ib Gb] [pxb Gb] IIC T4 Gb (-20 °C ≤ Ta ≤ 60 °C)
II 2 D Ex ib tb [ib Db] [pxb Db] IIIC T 60 °C Db (-20 °C ≤ Ta ≤ 50 °C)
E
DEMKO 07ATEX0705753X — G

4

Ex db ib [ib Gb] [pxb Gb] IIC T4 Gb (-20 °C ≤ Ta ≤ 60 °C) — D
Ex ib tb [ib Db] [pxb Db] IIIC T60 °C Db (-20 °C ≤ Ta ≤ 50 °C) — E
IECEx UL 08.0003X — G

A North American Markings (Divisions)

Class I | **Div. 1** | **Groups A, B, C, D** | **T4**

Permitted Class
- **Class I** = Gas/Vapor
- **Class II** = Dust
- **Class III** = Fiber or flying (No group designation)

Area Classification
- **Div. 1** = Ignitable mixture present continuously or intermittently
- **Div. 2** = Ignitable mixture is not normally present

Gas/Dust Group

Typical Gas	Typical Dust
A = Acetylene	**E** = Metal Dust
B = Hydrogen	**F** = Coal Dust
C = Ethylene	**G** = Grain Dust
D = Propane	

Temperature Class

T1 ≤ 450 °C	**T3A** ≤ 180 °C
T2 ≤ 300 °C	**T3B** ≤ 165 °C
T2A ≤ 280 °C	**T3C** ≤ 160 °C
T2B ≤ 260 °C	**T4** ≤ 135 °C
T2C ≤ 230 °C	**T4A** ≤ 120 °C
T2D ≤ 215 °C	**T5** ≤ 100 °C
T3 ≤ 200 °C	**T6** ≤ 85 °C

NOTE: Maximum surface temperature shown as Txxx °C is acceptable.

B US Zone Equivalency Markings

Class I | **Zone 0** | **Group IIC** | **T4**

Permitted Class
- **Class I** = Gas/Vapor (Option)

Area Classification
- **Zone 0** = Ignitable concentrations of gases or vapors (dust cloud) are present continuously or for long periods of time (Zone 20)
- **Zone 1** = Ignitable concentrations of gases or vapors (dust cloud) are likely to exist under normal operating conditions (Zone 21)
- **Zone 2** = Ignitable concentrations of gases or vapors (dust cloud) are not likely to exist under normal conditions and if they do, only for short periods (Zone 22)

Gas/Dust Group
- **IIA** = Lowest requirements - typical gas is propane
- **IIB** = Higher requirements - typical gas is ethylene
- **IIC** = Highest requirements - typical gas is hydrogen and acetylene
- **IIIA** = Combustible flyings
- **IIIB** = Nonconductive dust
- **IIIC** = Conductive dust

NOTE: For each group, II and III, only one subdivision is displayed. Subdivision C supersedes B, and B supersedes A.

This note is also applicable in sections D and E below.

Temperature Class
- **T1** ≤ 450 °C
- **T2** ≤ 300 °C
- **T3** ≤ 200 °C
- **T4** ≤ 135 °C
- **T5** ≤ 100 °C
- **T6** ≤ 85 °C

NOTE: For dust, the maximum surface temperature is displayed as "Txxx °C"

C US Zone Certified Equipment

Class I | **Zone 0** | **AEx**

Permitted Class
- **Class I** = Gas/Vapor (Option)

Area Classification
- **Zone 0** = Ignitable concentrations of gases or vapors (dust cloud) are present continuously or for long periods of time (Zone 20)
- **Zone 1** = Ignitable concentrations of gases or vapors (dust cloud) are likely to exist under normal operating conditions (Zone 21)
- **Zone 2** = Ignitable concentrations of gases or vapors (dust cloud) are not likely to exist under normal conditions and if they do, only for short periods (Zone 22)

Explosion protection to US requirements

D Markings (Zones) Gas/Vapor

Ex | **db ib** | **[ib Gb] [pxb Gb]** | **IIC** | **T4** | **Gb**

Explosion Protection

No Brackets
Indicates **type(s) of protection** for equipment permitted for installation in hazardous locations

Types of Protection
- **db, dc** = flameproof
- **eb, ec** = increased safety
- **ia, ib, ic** = intrinsic safety
- **ma, mb, mc** = encapsulation
- **nA** = non-sparking (now ec)
- **nR** = restricted breathing
- **nC** = protected sparking (some moved to dc)
- **nL** = energy limited (now ic)
- **ob, oc** = oil filled
- **op is** = optical radiation, inherently safe
- **op pr** = optical radiation, protected
- **op sh** = optical radiation, shutdown safety interlock
- **pxb, pyb, pzc** = pressurization
- **qb** = powder filled
- **sa, sb, sc** = special protection

Gas Group
- **I** = Mining susceptible to firedamp
- **II** = Gas/vapors other than mines
- **IIA** = Lowest requirements - typical gas is propane
- **IIB** = Higher requirements - typical gas is ethylene
- **IIC** = Highest requirements - typical gas is hydrogen and acetylene

Temperature Class

T1 ≤ 450 °C	**T4** ≤ 135 °C
T2 ≤ 300 °C	**T5** ≤ 100 °C
T3 ≤ 200 °C	**T6** ≤ 85 °C

NOTE: For equipment not permitted to be installed in hazardous locations the marking will not have a temperature class

Equipment Protection Level (EPL)

Ga = Very High (Zone 0)	**Ma** = Mining "Very high"
Gb = High (Zone 1)	**Mb** = Mining "High"
Gc = Enhanced (Zone 2)	

Brackets

Indicates type(s) of protection that are provided as "outputs" going into a hazardous location.

If the device is an Ex associated apparatus (has IS outputs), the Ex type of protection is displayed in brackets. If it in some other way provides output or control associated to Ex safety (associated equipment), the Ex type(s) of protection are displayed in brackets.

If the device is both associated equipment and associated apparatus, the listing of the types of protection methods will be in separate sets of brackets (as shown in this example).

If a material group or EPL is within the brackets, then it only applies to the "output" identified within the set of brackets, and may differ from the equipment or other "outputs".

If types of protection are only shown within brackets (for example [Ex ia Ga]) equipment is not permitted to be installed in hazardous location, but provides outputs that may go into hazardous locations.

E Markings (Zones) Dust

Ex | **ib tb** | **[ib Db] [pxb Db]** | **IIIC** | **T 60 ºC** | **Db**

Explosion Protection

No Brackets
Indicates **type(s) of protection** for equipment permitted for installation in hazardous locations

Types of Protection
- **ia, ib, ic** = intrinsic safety
- **ma, mb, mc** = encapsulation
- **op is** = optical radiation, inherently safe
- **op pr** = optical radiation, protected
- **op sh** = optical radiation, shutdown safety interlock
- **pxb, pyb, pzc** = pressurization
- **sa, sb, sc** = special protection
- **ta, tb, tc** = protection by enclosure

Brackets

Indicates type(s) of protection that are provided as "outputs" going into a hazardous location.

If the device is an Ex associated apparatus (has IS outputs), the Ex type of protection is displayed in brackets. If it in some other way provides output or control associated to Ex safety (associated equipment), the Ex type(s) of protection are displayed in brackets..

If the device is both associated equipment and associated apparatus, the listing of the types of protection methods is displayed in separate sets of brackets (as shown in this example).

If a material group or EPL is within the brackets, then it only applies to the "output" identified within the set of brackets, and may differ from the equipment or other "outputs".

If types of protection are only displayed within brackets (for example [Ex ia Ga]), equipment is not permitted to be installed in a hazardous location, but provides outputs that may go into hazardous locations.

Dust Group
- **III** = Dust other than mines
- **IIIA** = Combustible flying
- **IIIB** = Nonconductive dust
- **IIIC** = Conductive dust

Maximum Surface Temperature

Indication of the maximum surface temperature of the equipment. If there is no subscript number next to the "T", the surface temperature shown is with no dust layer on the equipment.

If there is a subscript number next to the "T", for example T_{50} 60 °C, this indicates the maximum dust layer thickness in mm under which the surface temperature indicated is still valid.

Equipment Protection Level (EPL)
- **Da** = Very High (Zone 20)
- **Db** = High (Zone 21)
- **Dc** = Enhanced (Zone 22)

F ATEX Markings

Ex CE 0539 **II 2 GD**

Equipment Group
- **I** = Mining industry
- **II** = Surface industry

Equipment Category
- **M1** = Present continuously—equipment cannot be de-energized (mining)
- **M2** = Present continuously—equipment can be de-energized (mining)
- **1** = Very high level of protection (Zone 0, 20)
- **2** = High level of protection (Zone 1, 21)
- **3** = Normal level of protection (Zone 2, 22)
- **(..)** = Mounted in safe area
- **No Parentheses** = Mounted in hazardous area

Hazardous Atmosphere
- **G** = Gas
- **D** = Dust

G Certificate Numbers

IECEx

IECEx aaa yy nnnn X
- **IECEx** = indication that the certificate number to follow is for IECEx certification
- **aaa** = certification body
- **yy** = year certificate originally issued
- **nnnn** = running number for certifying body
- **X** = could be **X, U, or Blank**
  - **X** = certified equipment with specific condition(s) of use
  - **U** = certified component. Cannot be installed by end user as is.
  - **Blank** = certified equipment with no specific conditions of use

ATEX

aaa yy ATEX nnnn X
- **aaa** = notified body
- **yy** = year certificate originally issued
- **ATEX** = indication that the number is for the **ATEX** certification
- **nnnn** = running number for certifying body (may be more than 4 numbers)
- **X** = could be **X, U, or Blank**
  - **X** = certified equipment with specific condition(s) of use
  - **U** = certified component. Cannot be installed by end user as is.
  - **Blank** = certified equipment with no specific conditions of use

H Enclosure Degree of Protection (IP)

Y Protection against ingress of solids—higher number supersedes lower number

0	No protection against live or moving parts
1	Protection against contact with solid foreign objects >50 mm
2	Protection against contact with solid foreign objects >12.5 mm
3	Protection against contact with solid foreign objects >2.5 mm
4	Protection against contact with solid foreign objects >1 mm
5	Protection against ingress of dust in harmful quantities
6	Complete protection against ingress of dust
X	Not tested

Z Protection against ingress of liquids—higher number supersedes lower number

0	No protection
1	Protection against drops of condensed water (i.e., no harmful effect)
2	Protection against liquid drops at 15° from vertical
3	Protection against spraying water up to 60° from vertical
4	Protection against splashing from any direction
5	Protection against water jets from any direction under stated conditions
6	Protection against powerful water jets from any direction under stated conditions
X	Not tested

Z Protection against liquids when submerged—does not supersede 0–6

7	Protection against water immersion under stated conditions of pressure and time
8	Protection against indefinite immersion in water under specified pressure

NOTE: Enclosure degree of protection (ingress protection) based on IEC 60529

Relevant Standards

			Zone Method				Division Method			
Protection Concept	Symbol	Zones	European Std.	International Std.	Canadian Std.	United States Std.	Class	Division	Canadian Std.	United States Std.
General	Ex	—	EN 60079-0	IEC 60079-0	CSA-22.2 No. 60079-0	ANSI/UL 60079-0	—	—	—	—
Flameproof/Explosionproof	db, dc	1, 2	EN 60079-1	IEC 60079-1	CSA-22.2 No. 60079-1	ANSI/UL 60079-1	I	1, 2	CSA C22.2 No. 30	UL1203/FM3615
Pressurization	pxb, pyb, pzc	1, 2/21, 22	EN 60079-2	IEC 60079-2	CSA-22.2 No. 60079-2	ANSI/UL 60079-2	I, II, III	1, 2	NFPA 496	NFPA 496
Powder Filled	qb	1, 2	EN 60079-5	IEC 60079-5	CSA-22.2 No. 60079-5	ANSI/UL 60079-5	—	—	—	—
Oil Immersion	ob, oc	1, 2	EN 60079-6	IEC 60079-6	CSA-22.2 No. 60079-6	ANSI/UL 60079-6	—	—	—	—
Increased Safety	eb, ec	1, 2	EN 60079-7	IEC 60079-7	CSA-22.2 No. 60079-7	ANSI/UL 60079-7	I, II, III	2	CSA C22.2 No. 213	UL121201/FM3611
Intrinsic Safety	ia, ib, ic	0, 1, 2/20, 21, 22	EN 60079-11	IEC 60079-11	CSA-22.2 No. 60079-11	ANSI/UL 60079-11	I, II, III	1, 2	CSA-222 No. 60079-11	UL913/FM3610
Nonincendive Techniques	nC, nR	2	EN 60079-15	IEC 60079-15	CSA-22.2 No. 60079-15	ANSI/UL 60079-15	I, II, III	2	CSA C22.2 No. 213	UL121201/FM3611
Encapsulation	ma, mb, mc	0, 1, 2/20, 21, 22	EN 60079-18	IEC 60079-18	CSA-22.2 No. 60079-18	ANSI/UL 60079-18	—	—	—	—
Optical Radiation	op is, op pr, op sh	0, 1, 2/20, 21, 22	EN 60079-28	IEC 60079-28	CSA-22.2 No. 60079-28	ANSI/UL 60079-28	—	—	—	—
Protection by Enclosure	ta, tb, tc	20, 21, 22	EN 60079-31	IEC 60079-31	CSA-22.2 No. 60079-31	ANSI/UL 60079-31	II, III	1, 2	CSA C22.2 No. 25	UL1203/FM3616

NOTE: For the US and Canada, the relevant product safety standard is also required

I Type Rating and Comparison

Rating Type	Protection Description
1	Indoor use, general-purpose, protects against general contact and falling dirt.
2	Indoor use, general-purpose, protects against falling dirt and dripping or light splashing of water.
3/3X	Indoor/outdoor use, protects against windblown and falling dirt, rain, sleet, and snow. Remains undamaged by ice formation. 3X adds increased corrosion protection.
3R/3RX	Indoor/outdoor use, protects against falling dirt, rain, sleet, and snow. Remains undamaged by ice formation. 3RX adds increased corrosion protection.
3S/3SX	Indoor/outdoor use, protects against windblown and falling dust, rain, sleet and snow. Ice-laden mechanisms remain operable. 3SX adds increased corrosion protection.
4/4X	Indoor/outdoor use, protects against windblown and falling dirt, rain, sleet, snow, splashing water, and hose-directed water. Remains undamaged by ice formation. 4X adds increased corrosion protection.
5	Indoor use, protects against falling dust, settling airborne dust, lint, fibers, and flyings (not hazloc-related). Also protects against dripping and light splashing of water.
6	Indoor/outdoor use, protects against falling dirt, rain, sleet, snow, hose-directed water, and water entry during temporary submersion at limited depth. Remains undamaged by ice formation.
6P	Indoor/outdoor use, protects against water entry during prolonged submersion. Remains undamaged by ice formation.
12/12K	Indoor use, protects against falling dirt, circulating dust, lint, fibers and flyings (not hazloc-related). Protects against dripping and light splashing of water, and light splashing and seepage of oil and non-corrosive coolants. 12K adds knockouts.
13	Indoor use, protects against falling dirt, circulating dust, lint, fibers and flyings (not hazloc-related). Protects against dripping and light splashing of water, and spraying, splashing, and seepage of oil and non-corrosive coolants.

NOTE: UL standards UL 50 and UL 50E for the US and CSA standards CSA C22.2 No. 94.1 and CSA C22.2 No. 94.2 for Canada are used for third-party certification (Listing) on Type-rated enclosures. NEMA 250 is used for self certification.

Electrical Explosion Protection Knowledge Base

Electrical Explosion Protection Literature

- Worldwide Explosion Protection Rules and Regulations
- Physical-Technical Principles
- Types of Protection for Electrical Apparatus
- Type of Protection "Intrinsic Safety"
- Dust Explosion Protection
- Non-Electrical Explosion Protection
- IEC/EN 60079-14: Explosion Protection for Technical Plants
- Type of Protection "Purge and Pressurization"

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The Pepperl+Fuchs Global Solution Engineering Centers (SECs) offer engineered and certified, tailor-made system solutions for customers all over the world. By manufacturing our components, boxes, control stations, and cable glands, we have complete control of the quality of the components. We lead the industry with innovative hazardous location products and services. No other automation provider can match our experience and our comprehensive portfolio.

The SECs work closely with our certification department to guarantee that we provide you with all the necessary certifications you need, including:

- ATEX and IECEx Zone-rated solutions
- UL and ETL Listed Division 1 and Division 2 solutions
- Solutions for industrial controls in locations with hazardous gas and dust

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