

Understanding Intrinsic Safety and the ATEX Directive

A hazardous work environment may contain flammable gases, vapors, mists, dusts, ignitable fibers or flyings. There are different protection concepts used in Europe and North America to classify the type of hazards present in industrial workplaces.

Intrinsic safety is a protection concept employed in potentially flammable/explosive atmospheres. Portable electrical devices such as personal sampling pumps, aerosol monitors, and gas detection devices, that are to be used in these environments must be intrinsically safe.

In order to have a fire or an explosion, fuel, oxygen and a source of ignition must be present. An intrinsically safe electrical device design assumes the fuel and oxygen are present in the atmosphere, but the electrical or thermal energy released is never great enough to cause ignition of flammable atmospheres.

Intrinsic Safety Testing

Independent approval agencies test and certify electrical devices designed to be intrinsically safe. The tests verify that electrical device failure during normal use and operation will not generate enough energy to ignite a flammable/explosive mixture of the hazard classes specified. Electrical devices like TSI's SIDEPAK™ line of instruments have been tested and certified by LCIE in Europe for ATEX intrinsic safety approval and the Canadian Standards Association (CSA) for U.S. and Canadian intrinsic safety approvals. The ATEX Directive and how to understand and apply it for everyday use in your workplace is discussed below.

ATEX Directive

General Discussion

The ATEX Directive (94/9/EC) replaces the former "Explosive Atmospheres and Gassy Mines Directive" (76/117/EEC) and is intended to bring products covered by the former directive into line with the other, so called "New Approach" CE Marking Directives for the European Union. The ATEX Directive covers electrical and mechanical equipment and protective systems that may be used in areas where potentially flammable/explosive atmospheres may be created by the presence of flammable/explosive gases, vapors, mists, dusts, ignitable fibers or flyings.

The major differences between the former and new intrinsic safety directives include the following:

- The inclusion of non-electrical equipment
- The inclusion of dust/aerosol atmospheres
- Requirements for safety related devices (flame/spark arrestors, suppression systems, etc.) and safe area equipment

Conversion of Existing Certifications

The vast majority of equipment certified before 1994 may not comply with the latest harmonized standards for the ATEX Directive. The ATEX Directive is mandatory under EU Law as of July 1, 2003. The new directive means far more equipment will require certification with the inclusion of mechanical equipment and protective systems to comply with this directive.

Product Categories

Products are required to be categorized by the level of protection that they offer against the risk of becoming a potential source of ignition of a flammable/explosive atmosphere.

The equipment conformity categories are as follows:

- Equipment Group I (mining)
 - **M1** – high integrity of protection for mining equipment (Two fault conditions)
 - **M2** – reliability concept of protection for mining equipment
- Equipment Group II (non-mining)
 - **CAT 1 (Zone 0)** – still safe with 2 faults
 - **CAT 2 (Zone 1)** – increased safety under abnormal operating conditions
 - **CAT 3 (Zone 2)** – equipment which is appropriate in normal operating conditions

ATEX Protection Concepts and Rating Nomenclature for Europe

Typical Material	*Apparatus Group
All Gases	II
Acetylene	IIC
Hydrogen	IC
Ethylene	IIB
Propane	IIA
Methane	I Mining (M1/M2)

*Apparatus Group – corresponds to the energy stored in electrical components or their susceptibility to generating a spark that would cause ignition.

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

**Maximum Surface Temperature – highest temperature that electrical components can get in normal or fault conditions.

***Temperature class rating for electrical components based on ignition from surface temperature.

Protection Concept	Symbol	Zone	Standard	How it works	Category
Intrinsic Safety	Ex ia	0, 1, 2	EN50020	Limit energy of sparks; limit the temperature	1
	Ex ib	1, 2	EN50039		2

Symbol	Classification	Criteria for Zone	ATEX Marking
Ex ia	Zone 0	Flammable material always present or for long periods (e.g., >1000 hr/yr)	G CAT 1
Ex ia	Zone 20	Flammable material always present or for long periods (e.g., >1000 hr/yr)	D Equipment
Ex ib	Zone 1	Flammable material present in normal operation (e.g., 10 to 1000 hr/yr)	G CAT 2
Ex ib	Zone 21	Flammable material present in normal operation (e.g., 10 to 1000 hr/yr)	D Equipment
Ex ib	Zone 2	Flammable material present for short periods only (e.g., <10 hr/yr)	G CAT 3
Ex ib	Zone 22	Flammable material present for short periods only (e.g., <10 hr/yr)	D Equipment

Temperature Class (electrical components)

Maximum Surface Temperature (°C)	450	300	200	120	100	85
ATEX CENELEC IEC Temperature Class	T1	T2	T3	T4	T5	T6

Determining the Intrinsic Safety Status of Work Environments

A hazardous work environment may contain flammable/explosive gases, vapors, mists, dusts, or ignitable fibers or flyings. Areas where potentially flammable/explosive atmospheres may be created by any of the above hazards must be evaluated by a qualified health and safety professional. It is the responsibility of the health and safety professional to understand this ATEX Zone Rating and CE Marking nomenclature and apply it to their workplace accordingly.

ATEX Zone Rating Approval: EEx ia AAA TY


EEx ia = ATEX Protection Concept Symbol (i.e., - EEx ia or EEx ib)

AAA = Apparatus Group (i.e., - II, IIC, IIB, and IIA)

TY = ATEX/CENELEC Temperature Class (i.e., T1, T2, T3, T4, T5, and T6)

CE Marking:  XX Y Z

Where,

 = CE Mark





XX = Equipment Group I (mining) or Group II (non-mining)







Y = Category or Zone Classification CAT 1, 2, 3 (Zone 0, 1, 2), respectively

Z = Gas/Vapor/Mist or Dust Rating (i.e., G or D)

Competitive Comparison Chart

ATEX Approvals for Personal Sampling Pumps

Make/Model	ATEX Rating	Comments
TSI		
SIDEPAK SP730	EEx ia IIC T2  II 1 G	
SIDEPAK SP530	EEx ia IIC T2  II 1 G	
SIDEPAK SP350	Not ATEX rated	
SIDEPAK SP330	EEx ia IIC T2  II 1 G	
SIDEPAK AM510	EEx ia IIC T2  II 1 G	Personal photometer
SKC		
210-TX Pocket Pump	EEx ia IIB T4	With 2.4V battery back
222 Workhorse Pump	Not ATEX rated	No ATEX rating listed
ExEc Pump	Not ATEX rated	ATEX model planned, no delivery date available
Sidekick Pump Models 224-51TX; 224-52TX	EEx ia IIC T4	
AirLite Pump	Not ATEX rated	AA-size batteries only, for use in non-explosive atmospheres only
Universal Pump Models 224-PCTX4; 224-PCTX8	EEx ia IIC T4	
Leland Legacy Pump	Not ATEX rated	Lilon battery, for use in non-explosive atmospheres only

Make/Model	ATEX Rating	Comments
Gilian		
BDX II	Not ATEX rated	UL Approved only
Gilian 3500	EEx ib IIB T4 	
GilAir-3	EEx ia IIC T4	
GilAir-5	EEx ia IIC T4	
LFS-113	EEx ib IIB T4 	
HFS-513	No information available	
AP Buck		
Libra	Not ATEX rated	Intrinsic safety approvals pending
Libra Plus	Not ATEX rated	Intrinsic safety approvals pending
Basic-1	Not ATEX rated	Determining if ATEX approval is feasible
Basic-5	Not ATEX rated	Determining if ATEX approval is feasible
Basic-12	Not ATEX rated	Determining if ATEX approval is feasible
VSS-1	Not ATEX rated	Determining if ATEX approval is feasible
VSS-5	Not ATEX rated	Determining if ATEX approval is feasible
Casella		
APEX	EEx ia IIB T4 	
APEX Pro	EEx ia IIB T4 	
Microdust I.S.	<u>Control Module</u> EEx ia IIC T4  <u>Probe</u> EEx ia IIC T4 	An area monitor, not a personal photometer

All information based on most current available published data.



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