

Terminal blocks entrelec® Explosive atmospheres protection

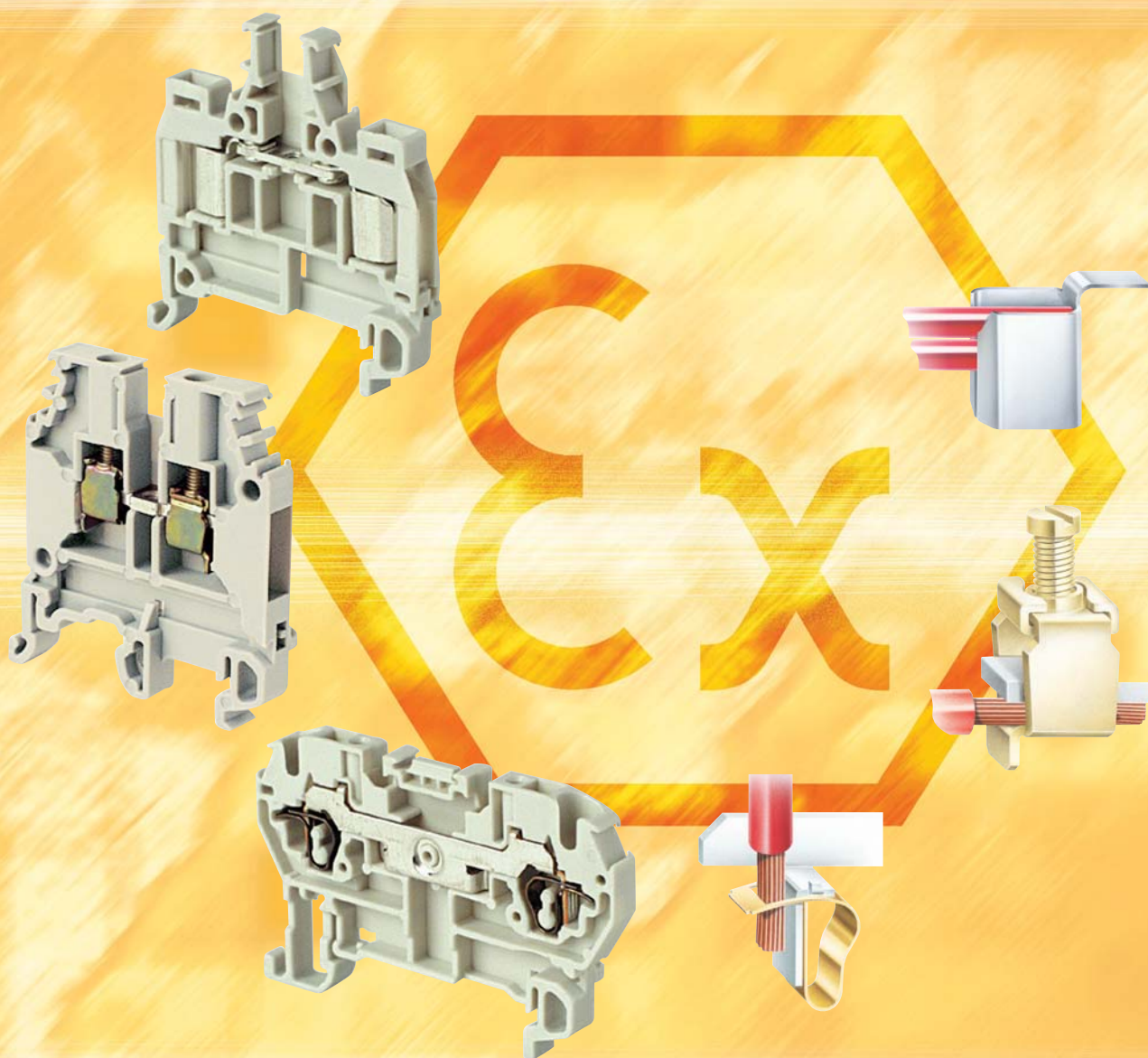


ABB Entrellec® : The best in connection

Introducing the new ABB Entrellec® ATEX certified terminal block range



As one of the world leaders in connection technology and the world's leading supplier to the oil and gas transportation industry, ABB is pleased to introduce you to its dedicated terminal block range for safe use in explosive atmospheres.

The range is certified to the highest possible certification level of the new ATEX 94/9/EC European directive and offers maximized safety to offer you true security products.

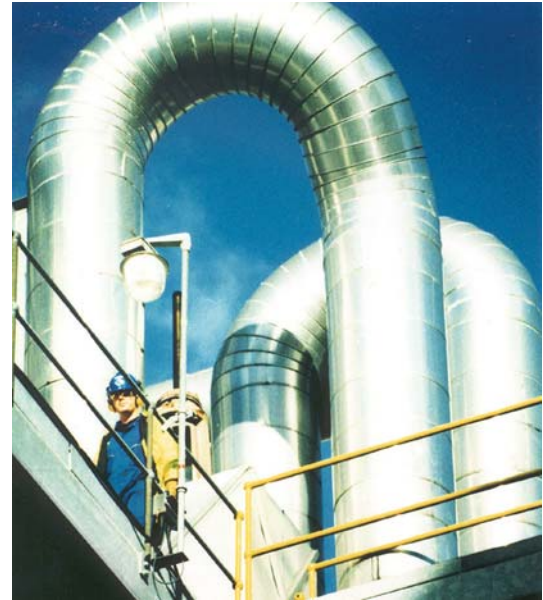
Safe use and Applications



ABB's dedicated ATEX range is designed and certified for use in all industries with potentially explosive atmospheres caused by gas or dust inflammation such as: petrochemical industries, offshore installations, mines industries, flour mills, silos ... etc...

The following pages are meant to provide you with some basic information relative to the ATEX directive and protection methods particularly suitable for terminal blocks.

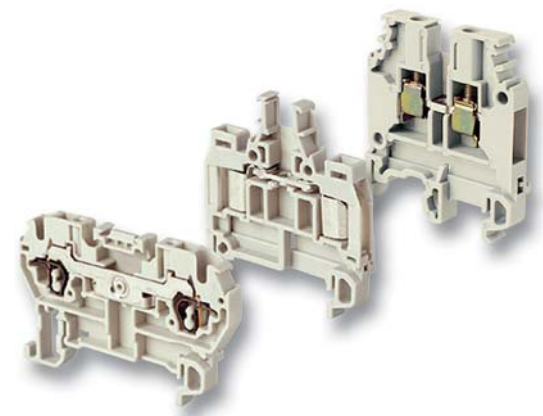
We insist on the increased demand for safety required by the ATEX directive and describe what has been the design and manufacturing choice of ABB to provide you with true security products.



Comprehensive range

The ATEX terminal block range provides terminal blocks in the three main technologies: screw clamp, spring clamp and ADO system® in feed through (grey), neutral (blue) and ground versions. ABB ATEX terminal block range is available in V0 (per UL94) material.

As we are constantly extending our product portfolios, please do not hesitate to contact your local sales if you would like to request an ATEX certified terminal block not mentioned in these pages.



Atex generalities

A. Explosive atmosphere	2
B. European explosion directives	4
C. ATEX 94/9/EC conformity assessment procedures	8
D. Protection methods in potentially explosive atmosphere	10
E. Product marking	12
F. ABB Entrelec® terminal blocks & accessories certification	13

Atex certified terminal blocks range

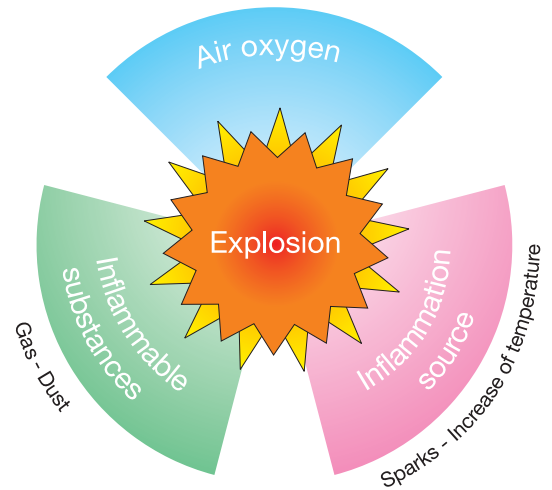
Summary	15
----------------------	-----------

A. Explosive atmosphere

Conditions

An explosion can occur if the following factors are combined:

- Presence of inflammable substances
- Presence of an ignition source or inflammation source: fire, flame, electrical or mechanical sparks, overheated surfaces, electrostatic discharges
- Oxygen



Inflammable substances can be listed as follow :

Inflammable gas	Inflammable liquid	Inflammable dust
<ul style="list-style-type: none"> - Liquid gas: butane, butene, propane, propylene - Smoke: carbon monoxide, methane. - Chemical gas substances : acetylene, acetylene oxide, vinyl chloride 	<ul style="list-style-type: none"> - Solvents, fuel, oil, heating oil, painting, chemical substances 	<ul style="list-style-type: none"> - Coal - Wood dust - Human and animal food products : sugar, flour, cereal - Plastic material - Metal

Ignition source:

Electrical energy may be dangerous if used close to an inflammable substance as it is considered as a potential source of ignition. Indeed, sparks, arcs or dangerous temperature levels are generated by the electrical energy.

Protection:

Particular methods of protection have thus been investigated in order to allow the use of electrical equipment in hazardous areas.

Concerned industries

The risk of explosion is particularly high in certain types of industries, which generate inflammable gas, inflammable liquid or inflammable dust. Indeed, the new ATEX directive now considers the explosion risk caused by dust.

We can list :

- Refineries,
- Petrochemical and chemical industries,
- Off shore installations,
- Mining industries,
- Human and food industries...





The risk can be expressed as follow :

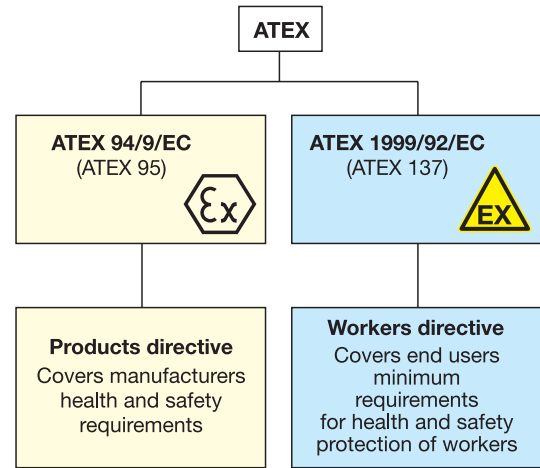
Industries	Risks
Refineries	Treatment of hydrocarbon highly inflammable
Petrochemical and chemical industries	Transformation and treatment processes which can generate explosive mixing
Pharmaceutical and cosmetic industries	Use of alcohol highly inflammable like solvents Use of active material or adjuvant which can create explosive dust
Waste and water recycling industries	Paper or plastic dust Storage of barrels or containers partially or not emptied Gas fermentation emission during water treatment
Painting facilities	Over spray formation during the lacquering of surfaces with spray gun
Gas distribution	Gas/ air mixing creation if gas leaking
Human and animal food industries	Transport and stocking of cereal, powder... which can create potentially dust explosive atmospheres in filters and aerators
Wood saw mills, metal machining	Metal dust generation during metal polishing which can create dust explosive atmospheres in collectors



B. European explosion directives

ATEX European directive consists in two parts :

- ATEX 94/9/EC (generally called ATEX 95), which concentrates on the duties of the manufacturers.
- ATEX 1999/92/EC (generally called ATEX 137), which focuses on the end users obligations.



Directive applicable to ABB Entrelec "terminal blocks"

The objectives of the directives

“Minimum requirements” is a key phrase of the directives - member states are free to introduce more stringent measures if they wish.

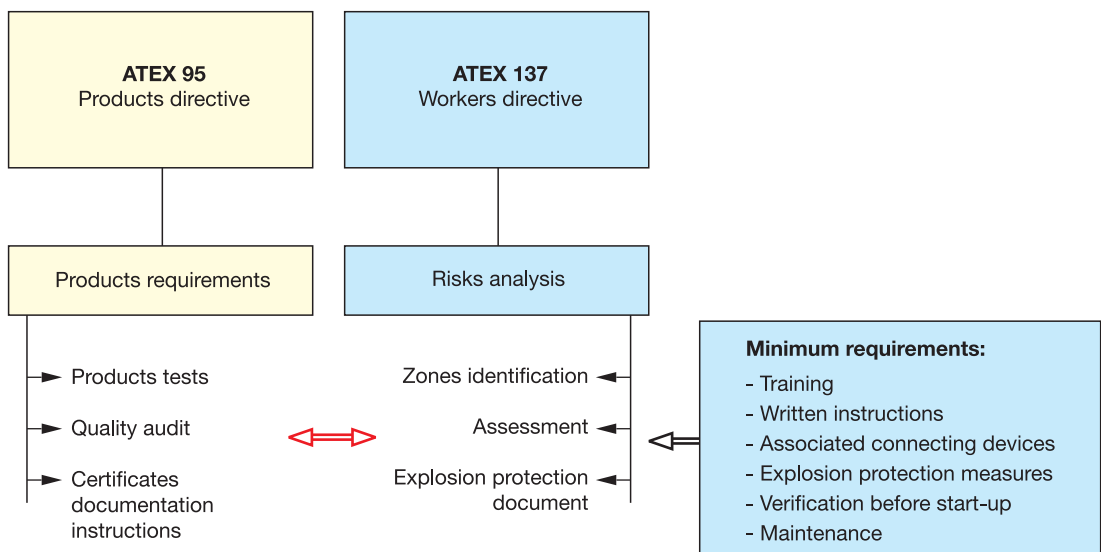
ATEX belongs to the group of the so-called “new approach” directives.

Under a new approach directive, any route towards achieving the objective is permitted.

The European commission will not interfere with how a technical solution is reached, but gives all parties involved the freedom to define the best means, methods and procedures to meet the guidelines.

This gives rise to a division of responsibilities between the equipment manufacturer and the end user.

The less responsibility the equipment manufacturer assumes for achieving the solution, the more the end user will have to take on, and vice versa.



ATEX 95 : Equipments and components



The objective of the ATEX 95 directive is to reinforce safety aspects. It is more restricting than the former directive 76/117 EEC, as it does not only concentrate on the product but on the whole process.

The manufacturer's quality assurance is now audited through the relevant standard NF EN 13980 Potentially explosive atmospheres - Application of quality systems.

Extract of the EN 13980 §7.5.3: The manufacturer shall establish and maintain procedures for product identification during all the stages of production, testing, final inspection and placing on the market.

Traceability is required with respect to final product and its significant parts.

The "production quality assurance notification" is the highest assurance quality certification level achievable.

- ATEX products are considered as safety devices: the entire process from the design to the installation must be strictly controlled.
- Product and company quality assessment which allow design, manufacturing and sales.
- Requirements in terms of organization for designing, manufacturing and selling.

ABB commitments versus ATEX 95

- Terminal blocks are **unitary** controlled - unitary dielectric control on finished product
- **Maximized security** is guaranteed through dedicated manufacturing processes, dedicated manufacturing sites and dedicated inventory locations .
- **Reinforced traceability** for accurate identification of the ATEX customers through dedicated part numbers for the ATEX range and batch number registration.

Dates of enforcement

ATEX 95 : Equipment and components

- From July 1st 2003, equipment, protection systems and electrical components used in potentially explosive atmospheres must comply with the European directive ATEX 94/9/EC (ATEX 95).

ATEX 95 abrogates the directive 76/117/EC and becomes mandatory for all new equipment installed after 06/30/03.

Former Ex products, already in stock, can still be installed if they are to replace used parts in already active installations.

ATEX 137 : Installations



The addition of the new "workers directive ATEX 137" reinforces the safety level even further.

- Risk analysis : requires that the employers draw up evidence of risk analysis for their site.
- Area classification : area classification into zones and site inspections must be carried out where potentially explosive atmospheres may develop.
- Explosion protection document : Information such as written instructions, training programs, and clearance for work... must be defined in the "explosion" protection document" and respected in order to guarantee the protection of the staff.
- ATEX certified products must be selected according to zone.
- Locations where explosive atmospheres may occur and identified through warning signs.

ABB commitments versus ATEX 137

- **Reliable product information** is given to the end user : increased safety and intrinsic safety certified terminal blocks for safe installation.
- **Excellence of ADO system®** in regards to the ATEX 137 minimum requirements (training programs, written instructions, clearance for work...):
 - Simplified "clearance for work": no possibility of unauthorized modifications thanks to the ADO system® dedicated tool (OUMAD, OUPAD or OUTAD) .
 - Maximized "correct installation and operation, qualification of the personnel" : the ADO system® connection is operator independent.
 - No retightening maintenance : ADO system® is a Screwless technology.

Dates of enforcement

ATEX 137 : Installations

- The ATEX 1999/92/EC (ATEX 137) directive becomes mandatory for all new installations implemented after 06/30/03, in every country member of the EEC. For existing installations, three more years are given to fulfill the minimum requirements.

If an old work place is upgraded, modified or extended, it must comply with the "minimum requirements" immediately.

Definitions and terms

Equipment and components used in potentially explosive atmospheres are divided into groups and categories. (Atex 94/9/EC, chapter 1, art 1, § 3c)

This classification is meant to define clearly the “intended use” of equipment, protective systems and devices, which is considered of prime importance for safe operation.

Groups

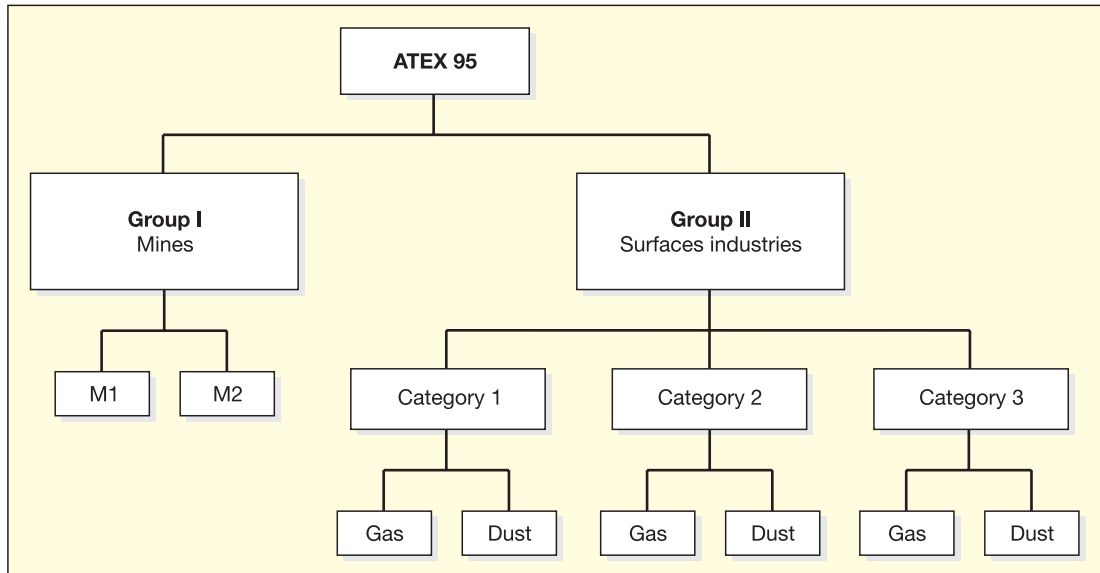
Two distinct groups according to the industry type in which the equipments or components are to be used :

- Group I stands for Mine industries :
Underground part of mines and surface installations of such mines, liable to be endangered by firedamp and / or combustible dust.
- Group II stands for Surface industries :
All other places liable to be endangered by explosive atmospheres.

Categories

ATEX defines “categories of equipment”, specified by their protection characteristics:

- For Mine industries :
 - Category M 1: very high level of safety
 - Category M 2: high level of safety
- For surfaces industries :
 - Category 1: very high level of safety
 - Category 2: high level of safety
 - Category 3: normal level of safety



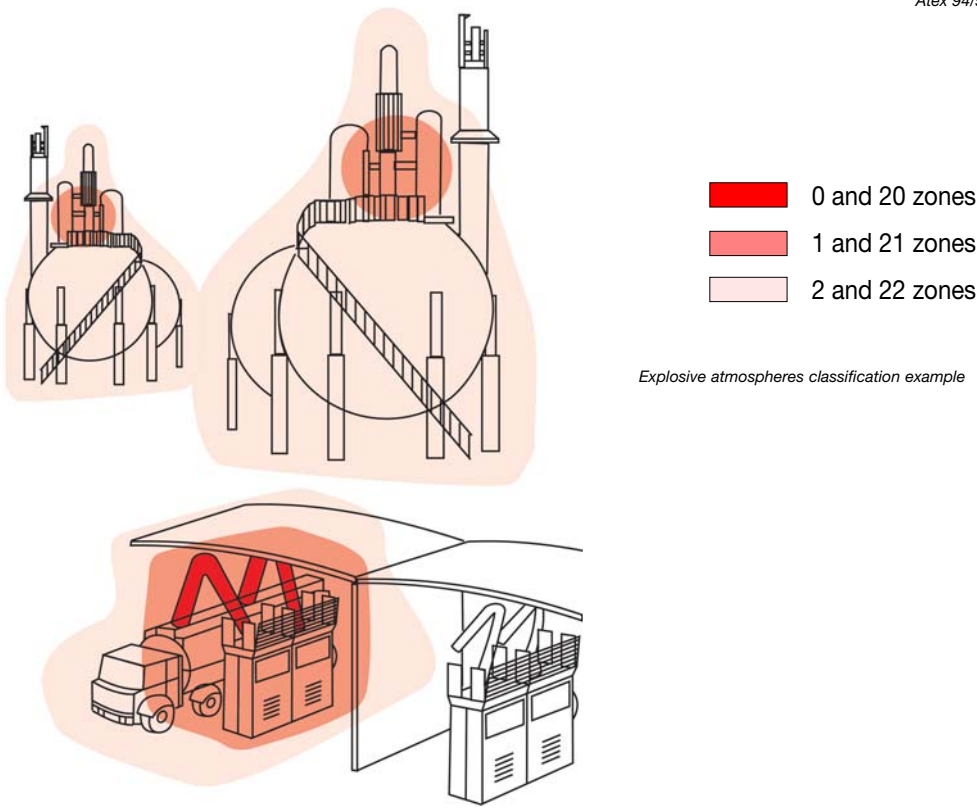
Frequently asked question :

If equipment is certified in category 1, is it certified in category 2?

Equipment or components certified in category 1 are also certified in category 2 and category 3 since category 1 is the highest level of safety.

Equipment in category :	Intended use :
<p>M1 (Mine industries) Is required to remain functional, even in the event of rare incidents relating to equipment, with an explosive atmosphere present.</p>	<p>In underground parts of mines as well as those parts of surface installations of such mines endangered by firedamp and/or combustible dust.</p>
<p>M2 (Mine industries) Is intended to be de-energized in the event of an explosive atmosphere. The means of protection relating to equipment in this category assure the requisite level of protection during normal operation and also in the case of more severe operating conditions, in particular those arising from rough handling and changing environmental conditions.</p>	<p>In underground parts of mines as well as those parts of surface installations of such mines endangered by firedamp and/or combustible dust.</p>
<p>1 (Surface industries) Must ensure the requisite level of protection, even in the event of rare incidents relating to equipment and is characterized by means of protection such that :</p> <ul style="list-style-type: none"> - Either, in the event of failure of on means of protection, at least an independent second means provides the requisite level of protection. - Or the requisite level of protection is assured in the event of two faults occurring independently of each other. 	<p>Zone 0 and Zone 20 : Areas in which explosive atmospheres caused by mixtures of air and gases, vapors or mists or by air/dust mixtures are present continuously, for long periods or frequently.</p>
<p>2 (Surface industries) Must 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>	<p>Zone 1 and Zone 21 : Areas in which explosive atmospheres caused by mixtures of air and gases, vapors or mists or by air/dust mixtures are likely to occur.</p>
<p>3 (Surface industries) Ensure the requisite level of protection during normal operation.</p>	<p>Zone 2 and Zone 22 : Areas in which explosive atmospheres caused by gases, vapors or mists or by air/dust mixtures are unlikely to occur or are likely to do so only infrequently and for a short period only.</p>

Atex 94/9/EC annex I



C. ATEX 94/9/EC conformity assessment procedures

The ATEX certification process can be identified as two main parts :

- The EC type examination certificate confirms that the validity of the technical file established by ABB is in conformity with the Atex directive. Examination and test results of the product are been examined by a notified body.
- The inspection of quality assurance, conducted by a notified body : refers to the production or product quality assurance examination (depending upon the product level of certification).

The notification has three years validity with yearly audit. As said in chapter B, ATEX directives objective is to increase the safety.

Therefore, a quality assurance audit is now necessary to obtain the ATEX certification for any equipment or component.

Complete conformity assessment procedure is detailed here below :

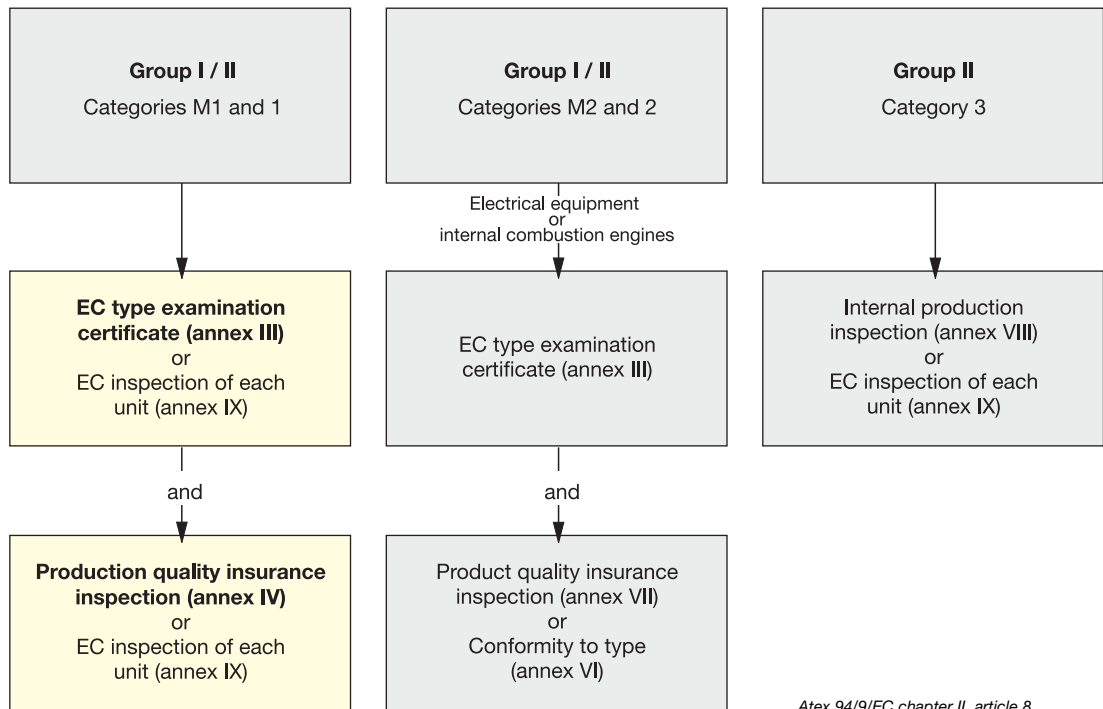


ABB certification conformity

- "Production Quality Insurance" inspection
- "EC type examination certificate"

Essential Health and Safety Requirements of the Directive.

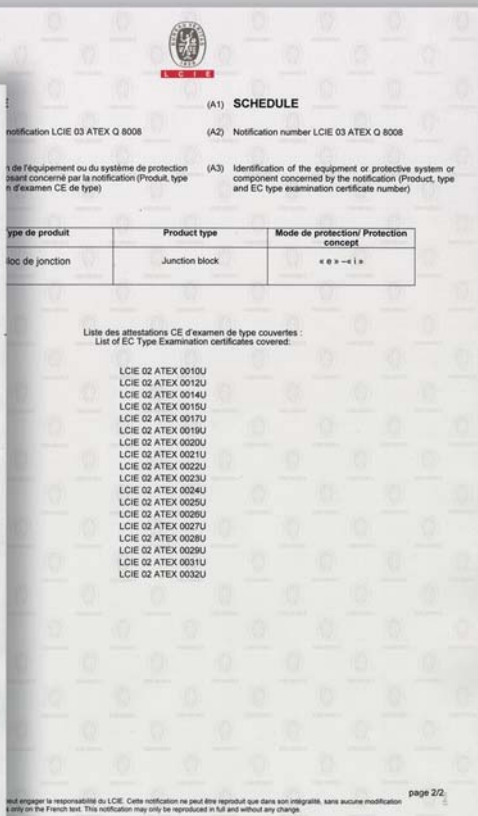
- Report of the manufacturer's Quality Assurance procedures to ensure that the "type" will continue to comply with the requirements.

Notified bodies

"Notified Bodies", are independant bodies which are appointed by the Member States. They have the relevant expertise and facilities to undertake the required procedures such as :

- "Type Examination", which involves an assessment made of the product against the

These "Notified Bodies" are given a number and are listed in the OJEC by the European Commission prior to their operation; the activities of the Notified Bodies are a matter for Member States, as they are appointed under their authority. While the Notified Body has various responsibilities under the Directive, the manufacturer always remains responsible for the compliance of the equipment.



Production quality assessment notification

Extract list of European Notified bodies and Certified bodies :

Country	Name	Notified Bodies (ATEX 94/4/EC)	Certified Bodies (IECEx)
Denmark	DEMKO	X	X
France	INERIS	X	
	LCIE*	X	X
Germany	PTB	X	X
	TÜV	X	X
Italy	CESI	X	
Netherland	KEMA	X	
Norway	NEMKO	X	X
Sweden	SP	X	X
UK	SIRA	X	X

*LCIE : identification code 0081
Subsidiary of Bureau Veritas group



EC type examination certificate

D. Protection methods in potentially explosive atmosphere

Protection methods are to be implemented so that equipment and electrical components can be used in a potentially explosive atmosphere.

Safety methods :

Protection types	Principles
Ex d : flame-proof	Contains the explosion in an appropriate explosion proof housing.
Ex e : increased	Increases the reliability of the electrical components so that sparks or arcs cannot appear. Ex e voltage to apply is determined through severe limitations in the calculations of clearance and creepage distances.
Ex i : intrinsic	Reduces the energy to a very low energy level so that even sparks or arcs cannot ignite an explosion atmosphere.
Ex m, Ex o, Ex p or Ex q	Prevent contact between the electrical component and the explosive atmosphere

Applications for Ex d, Ex e and Ex i protection types

● Flameproof protection Ex d

Among the several protection methods, flameproof “Ex d” protection method is the most ancient and therefore represents the protection method the most implemented.

Non-ATEX certified terminal blocks could be installed in a flameproof enclosure: the protection against explosion propagation is ensured by the enclosure not by the terminal block itself.

However, as it requires a very specific design (the enclosure must be capable of withstanding a possible internal explosion), this solution appears over costly for terminal block installations.

● Increased protection Ex e

Increased protection remains the best economical and technical choice for a safe use of terminal blocks in hazardous locations.

ABB ATEX terminal block range, certified in increased safety, requires a high level of construction technology and do not require an explosion proof (Ex d) enclosure to operate safely in an explosive atmosphere.

Please note that the enclosure containing the terminal blocks must offer a Dust protection (IP6X minimum) and be Ex e certified itself in order to determine the maximum surface temperature in the housing (calculations consider the number of terminal blocks in the housing and current to be applied).

● Intrinsic protection Ex i

Intrinsic protection is a common method of protection for instrumentation and control; it applies to an entire circuit.

Blue is generally the colour code for the intrinsic circuit components. It is the only protection method that can be implemented in zone 0 or 20 (permanent presence of explosive atmosphere), as the allowed voltage and current are extremely low.

Voltage and current calculations are necessary to ensure that the circuit composed of its several components will operate safely.

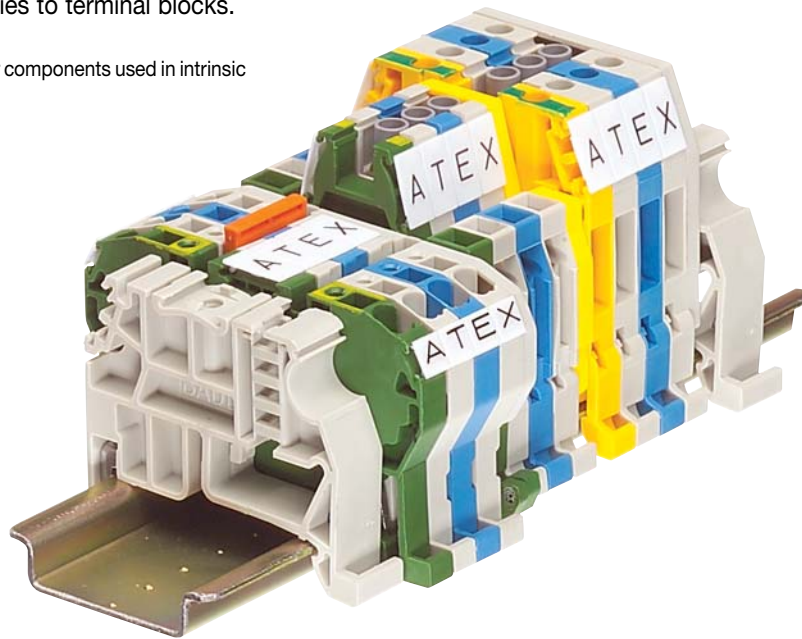
ABB supplies intrinsic and increased protection certified terminal blocks, even if the intrinsic certification is not mandatory for components.

The reasons are added benefits for our customers: it allows us to supply you with the ATEX appropriate group and category marked on the block as well as the Ex i necessary voltage calculations, which have been confirmed by a notified body.

Terminal blocks use

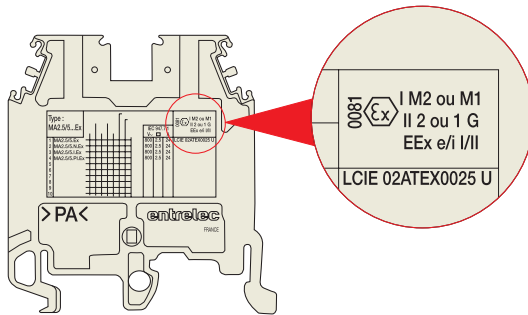
Here below are the protection methods, for which the ATEX certification applies to terminal blocks.

(*certification is not mandatory for components used in intrinsic protection only)



CENELEC standards	IEC standards	Protection methods	Symbol	Concepts
EN 50 014	IEC 60079-0	General rules		
EN 50019	IEC 60079-7	Increased safety	e	No sparks or arcs in normal use. Control of dangerous temperature levels : because they can generate arcs or sparks in normal use, switch or fuse terminal blocks cannot be classified in increased protection.
EN 50020	IEC 60079-11	Intrinsic safety	i	Control of sparks, arcs or overheating through a very low energy level

E. Product marking



- The directive ATEX 95 imposes a new marking for certified equipment and components. (Atex 94/9/EC, annex II).
- The terminal block marking must indicate the group and categories in which it can be used, associated with the protection method.
- The Notified body code must be indicated as well as the EC type examination certificate number for each certified block.

Characteristics not marked on ABB terminal blocks



The CE logo does no longer appear on ABB ATEX terminal blocks. Components cannot affix the CE marking. (ATEX 94 /9/EC, chapter 2, article 8).

Components definition (Atex 94/9/EC, chapter 1, article 1) : means any item essential to the safe functioning of equipment and protective systems but with no autonomous function.

Suffix D (for Dust explosive atmosphere) :

The D marking does not appear on the ABB terminal blocks : equipment and components used in dust explosive atmospheres have to offer an IP6X degree of protection -total protection against dust penetration-.

The “D” certification is then irrelevant to terminal blocks -the terminal blocks design can never provide IP6X protection-.

The terminal blocks dust protection is ensured by an enclosure, with a minimum IP6X dust protection, on which the D marking is indicated.

Temperature class :

This characteristic applies to the maximum surface temperature authorised for ATEX certified equipment.

The temperature class is not indicated on components such as terminal blocks since this characteristic is specified for equipment only.

The equipment manufacturer is responsible for the validation of the maximum surface temperature of its equipment, in regards to the devices composing it and in ambient temperature of -20°C +40°C.

Please note that the temperature elevation for a terminal block will never exceed 45°K (per IEC 947-7-1) at its rated current and nominal wire size.

The operating temperature is -40°C +65°C with an acceptable -55°C in operating conditions.

Gas class :

This characteristic defines the various types of gas surrounding the equipment.

The gas class is not indicated on terminal blocks since this characteristic is specified for equipment only and not for components.

F. ABB Entrellec® terminal blocks & accessories certification

ATEX Terminal block range certification level

- EEx e IM2 and II2G and
- EEx i IM1 and II1G

The ABB attestation of conformity guarantees the end user the conformity of the product in regards with the ATEX 95 directive and applicable standards. It is generic to the whole ATEX range.



Accessory certification

ABB Entrellec® terminal block accessories are automatically ATEX certified.

Please refer to the catalogue pages for the accessory list per terminal block.

Some accessories like jumper bars or shielding connectors may declass the terminal block voltage.

The detailed voltage is not indicated in the EC type examination certificate - the examination certificate, issued by the notified body, is meant to establish the ATEX terminal block conformity only-.

Technical instruction sheets are at your disposal with all data for the appropriate voltage values as well as the operation and maintenance instructions.

Please request them from your local sales.



example of terminal blocks technical instruction sheet

G. Terminal blocks UL Hazardous Locations certification

**UL Hazardous locations terminal
block range certification level :**

Class I Zone 1 Ex e II T6

*(Partial range, indicated by * in the products pages)*



UL hazardous locations definitions and terms :

Class I Zone 1 :

- Location in which ignitable concentrations of flammable gases or vapors are likely to exist under normal operating conditions ; or
- Location in which ignitable concentrations of flammable gases or vapors may exist frequently because of repair or maintenance operations or because of leakage ; or
- Location in which equipment is operated or processes are carried on, of such a nature that equipment breakdown or faulty operations could result in the release of ignitable concentrations of flammable gases or vapors and also cause simultaneous failure of electrical equipment in a mode to cause the electrical equipment to become a source of ignition ; or
- That is adjacent to a Class 1, Zone 0 location from which ignitable concentrations of vapors could be communicated, unless communication is prevented by adequate positive pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided.

Ex e : increased safety protection method

II : stands for gas group (IIA, IIB, and IIC)

T6 (Temperature classification) : $T \leq 85^{\circ}\text{C}$ (185°F)

Please refer to the appropriate UL file for conditions of use and ratings values to apply.

References :

- <http://europa.eu.int/comm/enterprise/atex>
- Directive 1999/92/EC
- Directive 94/9/EC
- <http://www.ul.com/hazloc>
- Guidelines on the application of directive 94/9/EC
- <http://www.offshore-technology.com>
- Corrigendum of directive 94/9/EC