

## Ex Marking and Labeling

EXPLOSIVE ATMOSPHERES



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### Introduction

Electrical Ex equipment must be identifiable as Ex otherwise it is simply not Ex equipment. Marking of Ex equipment also has a huge impact on the safety of an Industrial Plant or Mine where Ex equipment is to be installed. It is of vital importance that the installer understands the marking and is able to identify Ex equipment correctly. It could be disastrous if Ex equipment is incorrectly selected due to the installer not understanding the marking. It could also cause an explosion and possible loss of production, equipment or ultimately human life.

### Legislation

A closer look at the ARP 0108:2014 document reveals the following, this is the document which regulates the Ex industry in South Africa and is also referenced in the Mines Health and Safety Act as well as the Occupational Safety and Health Act

*Text from the ARP 0108:2014*

#### **ARP 0108 : 2014**

##### *Paragraph 7*

- *Due to the **potential disastrous consequences** if the **wrong equipment is used**, it is of vital importance that all equipment be clearly labelled with information supporting the **safe use of the equipment**. **Such marking must be durable, visible in all configurations and legible.***

##### **7.3 Test for durability**

**7.3.1** *Rub the marking lightly for 15 seconds with a piece of cloth soaked with water*

**7.3.2** *After drying, rub for a further 15 seconds with a piece of cloth soaked in white spirit.*

*Note: White spirit is also known as mineral spirits, mineral turpentine, turpentine substitute, petroleum spirits and solvent naphtha content of 25%, by mass, of c7 to c12 aromatic hydrocarbons.*

If Ex equipment is sent in for repairs ARP 0108 : 2014 states the following:

#### **Repair Labels**

##### **ARP 0108: 2014 Annex A**

**A.13** *Any repairer shall attach to the product a **durable, legible and noticeable label** that gives at least the following information:*

- The repairer's certificate number (when operating under an approved certification mark scheme for Ex certified equipment)*
- The IA certificate number*
- The name of the repairer*
- The month and year of repair or overhaul.*

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**A13 Note:** It is **not** intended that the need for a repair label be applicable to routine maintenance or replacement of identical parts.

**A.14 The label fitted by the original equipment manufacturer (OEM) shall not be removed, but labels fitted by previous repairers shall be removed. If the OEM label is missing, the repairer may submit the finished product to an ATL (Approved Test Laboratory) and have the product re-certified to the current national standard. In this case, the repairer shall fit a supplier's plate displaying the new IA certificate number.**

## IA Certificate

The IA certificate is the document which is supplied by the Test Laboratory and refers to the suitability of the Ex equipment. The document also shows the standards to which the equipment was tested and complies with. It also contains detail on the required marking that must be displayed on the equipment.

*Paragraph from an actual IA certificate related to the marking:*

5.	MARKING
	The following (or similar) information have to be clearly and permanently marked on all units:
	Supplier : Pratley Manufacturing and Engineering (Pty) Ltd
	Manufacturer : Pratley Manufacturing and Engineering (Pty) Ltd
	Equipment : Rectangular Enviro Cable Box
	Model/Type : Size 1
	Serial No : ----
	Ex Rating : Ex e IIC T6 Gb, Ex nA IIC T6 Gc and EX t IIIC T6 Db
	IA Certificate No : S-XPL/16.0786 X

Let's have a closer look at marking which is most commonly found on Ex Junction Boxes:

*Example:*

**E Ex de II B T4 G b Ta = 53°C IP 68**  
**Max Dissipated Power = 3.65 W**  
**S-XPL/03796 (X) (U)**

**E Ex de II B T4 G b Ta = 53°C IP 68**

**"E"** – Indicates that the product is built and tested according to European Standards

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**E Ex de II B T4 G b Ta = 53°C IP 68**

**"Ex"** - Indicates that the equipment is Explosive Protected

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**E Ex de II B T4 G b Ta = 53°C IP 68**

**"de"** - All of the main methods or Protection Concepts, used to achieve overall Ex protection are indicated, using one or more of the following abbreviations:

- d – Flameproof (druckfest)
- e – Increased Safety (erhöhte sicherheit)
- m – Encapsulation (moulding)

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- p – Pressurization (or purging)
- q – Sand filled (quenching)
- i – Intrinsic Safety
- n – Non sparking (Zone 2 only)
- ta – Combustible Dusts
- tb – Conductive Dusts
- tc – Ignitable Fibres

And many others

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### E Ex de II B T4 G b Ta = 53°C IP 68

- “I” - for Apparatus Group I - For mines susceptible to firedamp. Re Methane present  
“II” - for Apparatus Group II - Flammable locations in all other industries. (Surface)  
“III” - for Apparatus Group III – Explosive dust atmospheres other than mines susceptible to fire damp
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### E Ex de II B T4 G b Ta = 53°C IP 68

II B - Gas Group I, IIA, IIB or IIC

#### Group I

Firedamp found in underground Mines, re. Methane, Coal Dust and other gasses.

#### Group IIA

Acetone, Acetic acid, Toluene and many others.

#### Group IIB

Town gas, Ethylene, and many others.

#### Group IIC

Hydrogen, Acetylene, Carbon Disulphide.

IIC indicates the most severe gas group and apparatus suitable for IIC is automatically suitable for IIA & B but not visa versa.

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### E Ex de II B T4 G b Ta = 53°C IP 68

T4 - Temperature Class:

The maximum surface temperature that electrical apparatus is permitted to reach, even under fault conditions. The temperature class must not be confused with ambient temperature. The temperature class is the outside touch temperature of the apparatus and must not exceed a certain temperature. The T- rating is to prevent the ignition of an explosive gas atmosphere or dust, which has settled on the junction box or which is suspended in the air.

- T1 – maximum surface temperature not to exceed 450°C
- T2 – maximum surface temperature not to exceed 300°C
- T3 – maximum surface temperature not to exceed 200°C
- T4 – maximum surface temperature not to exceed 135°C
- T5 – maximum surface temperature not to exceed 100°C
- T6 – maximum surface temperature not to exceed 85°C

Apparatus suitable for T5, for example can be used with T1 to T4 but NOT visa versa.

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See below ignition temperatures of a few explosive substances

Temp Class	T1	T2	T3	T4	T5	T6
Ignition Temp	>450°C	>300°C	>200°C	>135°C	>100°C	>85°C
			Wheat Flour			
	Methane		Aluminium Dust	Coal Dust		
			Iron Powder			
	Acetone	Ethanol	Petrol	Acetaldehyde		
	Ethane	I-Amyl Acetate	Diesel	Ethyl Ether		
	Ethyl Acetate	N-Butane	Kerosene			
	Ammonia	N-Butyl Alcohol	Paraffin			
	Acetic Acid		N-Hexene			
	Carbon Monoxide					
	Methanol					
	Propane					
	Toluene					
	Coal Gas	Ethylene				
	Hydrogen	Acetylene			Carbon Disulfide	Ethyl Nitrate

**E Ex de II B T4 G b Ta = 53°C IP 68**

The G indicates the hazardous substance

**G** if the flammable substance is a Gas, including vapors or mists.

**D** if the flammable substance is a Dust.

**M** if the flammable substance is in a Mine.

**E Ex de II B T4 G b Ta = 53°C IP 68**

The lower case **b** indicates the EPL - Equipment Protection Level which is directly related to the hazardous zone:

**a** for apparatus suitable for Zone 0, 1 and 2 (if preceded by G or M)

**a** for apparatus suitable for Zone 20, 21 and 22 (if preceded by D or M)

**b** for apparatus suitable for Zone 1 and 2 (if preceded by G or M)

**b** for apparatus suitable for Zone 21 and 22 (if preceded by D or M)

**c** for apparatus suitable for Zone 2 ONLY (if preceded by G or M)

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**E Ex de II B T4 G b Ta = 53°C IP 68**

Ta is the Ambient Temperature.

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In this instance the ambient (surrounding air) temperature needs to be kept below **53°C to maintain a T4 Surface temperature rating.**

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**E Ex de II B T4 G b Ta = 53°C IP 68**

IP indicates the Ingress Protection of the electrical apparatus

- The first digit IP **6X** = Dust or Solids
- Second digit IP **X8** = Liquids or mists

First digit	Protection against solids or dusts
0	No protection
1	Protection against solids > 50mm
2	Protection against solids > 12.5mm
3	Protection against solids > 2.5mm
4	Protection against solids > 1.0mm
5	Protection against dusts which could interfere with operation
6	Complete protection against dust

Second digit	Protection against ingress of water
0	No protection
1	Protection against vertically falling drops
2	Protection against vertically falling drops with enclosure at 15 Deg
3	Protection against water spray at any angle up to 60 deg
4	Protection against splashing liquid from any direction
5	Protection against a jet of water from any direction
6	Protection from powerful water jets from any direction
7	Protection from temporary immersion in water (1m deep)
8	Protection against continuous immersion in water (2m deep)

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**E Ex de II B T4 G b Ta = 53°C IP 68**

**Max Dissipated Power = 3.65 W**

**S-XPL/03796 (X) (U)**

**There is always a lot of confusion with “Max Dissipated Power”**

A common question people ask is: **“can they use this junction box to terminate cables for a 4kW pump motor?”** The answer is **yes** because the power is consumed outside the junction box.

**Dissipated power means power consumed within the junction box** and it is limited to 3.65 watts to prevent you from heating up the box from the inside, which will ultimately affect the T4 rating of the

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junction box. Dissipated power is normally heat generated from current flowing through the conductors or terminals.

**E Ex de II B T4 G b Ta = 53°C IP 68**

**Max Dissipated Power = 3.65 W**

**S-XPL/03796 (X) (U)**

This is the Test Laboratory inspection number or better known as the IA Certificate Number.

**(X)** – This means there is a **special condition** that needs to be complied with. The Special condition will be listed on the IA certificate as well as the Test Report. It is very important that the installer and end user familiarize themselves with the special condition prior to installing the Ex apparatus.

**(U)** – The junction box is **in-complete**, for example it might only be complete if it is fitted with Ex de cable glands.

View examples of labels found on Ex Equipment:

