

## Hazardous Area Information

- Intrinsic Safety (ia)
- Increased Safety (e)
- Flameproof Enclosure (d)
- Non-incendive (N)

### General Description

Thermocouple Instruments Limited produces a range of certified equipment to conform with most of the popular methods of Explosion Protection. This guide is intended to enable customers to select the best combination of equipment to meet their needs.

### Area Classification

Potentially hazardous areas are divided into Zones which are graduated according to the degree of risk.

#### Zone 0

Where an explosive gas-air mixture is continuously present, or present for long periods.

#### Zone 1

Where an explosive gas-air mixture is likely to occur in normal operation.

#### Zone 2

Where an explosive gas-air mixture is NOT likely to occur and, if it occurs, it will not exist for long periods.

#### Zone 20

Where an explosive atmosphere in the form of a cloud of dust in air is continuously present, for long periods, or frequently.

#### Zone 21

Where an explosive atmosphere in the form of a cloud of dust in air is likely to occur in normal operation.

#### Zone 22

Where an explosive atmosphere in the form of a cloud of dust in air is NOT likely to occur in normal operation but, if it does occur it will not exist for long periods.

### Gas Groups

Flammable gases, vapours and mists are classified in order of the ease with which they can be ignited in a mixture with air.

Apparatus is grouped according to the gases it may be used in.

#### Surface Industries

Group IIC: Acetylene Most easily ignited  
Group IIC: Hydrogen Less easily ignited  
Group IIB: Ethylene Less easily ignited  
Group IIA: Propane least easily ignited

#### Underground

Group 1: Methane (firedamp)

### Temperature Classifications

Hazardous area apparatus is classified according to the maximum surface temperature it might attain under fault conditions at an ambient temperature of 40°C, or at some other specified temperature.

Maximum temperatures for each "T" rating are as shown in the table below.

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

Apparatus intended for operation at ambient temperatures higher than 40°C is often given a dual "T" rating e.g. T4/T5.

This means that it is rated T5 in the normal ambient of 40°C, but if the ambient temperature is raised to 85°C the potential temperature rise in fault conditions will take it above the 100°C limit for T5, necessitating a T4 rating.

### Labelling

A typical label for an approved product will show details of the protection system, gas group and temperature rating.

Example: **EExia IIC T5**



## Intrinsic Safety - Exia

Intrinsic Safety is the ONLY completely safe Hazardous Area Protection system, as it relies on limiting the power available to cause a spark in the hazardous area.

This is achieved by using Zener Barriers or Isolating Repeaters, which prevent dangerous levels of Voltage or Current, even in the worst case such as a short circuit across the supply terminals of a transmitter.

The other vital factor is that the equipment situated in the Hazardous Area, such as our range of transmitters and their connecting cables do not store up sufficient energy to cause a spark, this is controlled at the design stage and certified by Cenelec.

The result is that a correctly installed I.S. system, using the approved barriers and cable parameters cannot cause a spark even in the event of gross negligence, for this reason it is the ONLY protection allowed in Zone 0 areas where explosive gasses are continuously present.

Because of this the enclosure requirements for I.S. equipment are not stringent, in fact all that is required is a housing with a degree of protection of IP20, which simply ensures that any electrical terminals etc., cannot be touched by fingers.

## Exia Equipment

### Temperature Transmitters

Models TR12 ,TR20, TR31, TR32 and TR48 are certified to the highest standard **EExia IIC T4, T5 or T6**.



**Model TR32**  
See Data Sheet  
TM-TT/TR32A

**Model TR31**  
See Data Sheet  
TM-TT/TR31A



**Model TR12**  
See Data Sheet  
TM-TT/TR12A

**Model TR48**  
See Data Sheet  
TM-TT/TR48A



## Loop Powered Indicator

The model DLI1 Loop Powered Indicator is certified **EExia IIC T5**.



**Model DLI1**  
See Data Sheet  
TM-AC/DLIA

## Thermocouples and RTDs

Thermocouple and RTD probe assemblies and sensors are considered *Simple Apparatus* and as such do not need to be certified. Nevertheless we can supply officially certified assemblies if required.



**Thermocouples and RTDs**  
See Data Sheets  
TM-PR/TCA and  
TM-PR/RTDA

## Exia and Exib

EExia is the highest grade of intrinsically safe approval, where the apparatus is *INCAPABLE* of causing ignition with any combination of TWO FAULTS applied, such apparatus has the highest level of protection and can be located in Zones 0, 1 and 2.

EExib is a lower category, which is *INCAPABLE* of causing ignition with any ONE fault; its use is restricted to Zones 1 and 2. Both EExia and EExib categories maintain a safety factor of 1.5 in normal operation with one fault, and are suitable for any gas group.

## Non Incendive - ExN

ExN is the least satisfactory protection concept. It specifies that the apparatus is not capable in Normal Operating Conditions of igniting a surrounding explosive mixture, therefore it must not produce sparks or generate excessive surface temperatures in normal use. Its use is limited to Zone 2 only where explosive mixtures are not expected, and will not exist for long periods.

ExN relies heavily on correct installation and maintenance, as any error such as leaving a screw loose or not fitting a cover correctly will create a potentially explosive situation.

## ExN Equipment

### Connection Heads

Models TDMC, NHD and SMSS are certified **ExN IIC T1-T6**. The T rating depends upon the maximum process temperature to be measured.

Conventional head / thermowell assemblies are given the variable T1-T6 rating because, in the event of thermowell failure, it is considered that the hot liquids or gases can enter directly into the certified connection head.

The "T" rating therefore depends on the maximum potential temperature rise caused by the temperature of the medium measured, for this reason unsealed assemblies cannot be used to monitor temperatures above 450°C.

Thermocouple Instruments Ltd also produces a sealed model. This features a double "O ring" seal to prevent ingress in the event of thermowell failure. This option can be used without a thermowell and is NOT restricted by the process temperature.



**Model TDMC**  
See Data Sheet  
TM-HD/TDMA



**Model NHD**  
See Data Sheet  
TM-HD/EHDA

**Model SMSS**



### Temperature Transmitters

Models TR12, TR20, TR31, TR32 and TR48 are certified to **ExN IIC T1-T6**.



**Model TR32**  
See Data Sheet  
TM-TT/TR32A

**Model TR31**  
See Data Sheet  
TM-TT/TR31A



**Model TR12**  
See Data Sheet  
TM-TT/TR12A

**Model TR48**  
See Data Sheet  
TM-TT/TR48A



## Increased Safety - Exe

Exe is a concept in which additional measures are taken to ensure that excessive temperatures or sparks do not occur in service, this is achieved by paying particular attention to the quality and reliability of materials and careful design of terminals etc., to prevent the possibility of sparks. Analog transmitters may not be fitted in Exe assemblies because the "wipers" of the adjustment potentiometers are considered to be potentially sparking

Exe assemblies can be used in Zones 1 & 2, but as above particular attention must be paid to correct installation, especially in Zone 1 areas where explosive mixtures are commonly present.

Exe certified thermocouple & RTD assemblies use special materials and construction methods; standard probes MUST NOT be used.

### Connection Heads

Models EHD and SMSS and H70 are certified to **EExe IIC T1- T6**. The T rating depends on the maximum process temperature to be measured.



**Model H70**  
See Data Sheet  
TM-HD/H70A  
(Standard Version)

**Model EHD**  
See Data Sheet  
TM-HD/EHDA



**Model SMSS**

## Flameproof - Exd

Flameproof protection depends on the enclosure being able to contain any explosion, preventing transmission of flames to the hazardous atmosphere surrounding the device.

The concept provides a good level of protection, if correctly installed and maintained, but its use is limited to Zones 1 and 2 areas where explosive mixtures are likely to occur in normal operation, but are not continuously present.

To achieve this the enclosure must be very strong and all entries, lids, covers and especially flame-path collars, must be made to a very high standard of quality and fit to prevent leakage and flame transmission.

### Connection Heads

Models XHD and H70 are certified to **EExd IIC T6**.



**Model H70**  
See Data Sheet  
TM-HD/H70A  
(Standard Version)

**Model H70**  
See Data Sheet  
TM-HD/H70A  
(Window Version)



**Model XHD**  
See Data Sheet  
TM-HD/XHDA