



## Hazardous Area Heating Equipment NEC 500 and 505 Comparison

Protherm Industries offers a range of heaters, all ETL approved to UL and CSA hazardous location standards. This document details the specific hazardous location markings of each product and the differences between them.

### Thermosafe® and Faratherm®:



The Thermosafe and Faratherm Induction Heaters are energy efficient, no maintenance heaters for drums and containers up to 55Gal (205L). They have the following markings:

### Thermosafe®:

Class I Zone 1 AEx e IIC 170°C (T3) Gb  
Class I Zone 1 Ex e IIC 170°C (T3) Gb

### Faratherm®:

Class I Zone 1 AEx e IIC 200°C (T3) Gb  
Class I Zone 1 Ex e IIC 200°C (T3) Gb

Conforms to UL Std.60079-0, UL Std. 60079-7, ANSI/UL Std. 499  
Certified to CAN/CSA Std. C22.2 No.60079-0, CAN/CSA C22.2 No.60079-7,  
CAN/CSA C22.2 No.88



**InteliHeat FlexiPlus®:**



The InteliHeat FlexiPlus Class I Zone 1 heating jackets are available in many standard and custom sizes for heating containers in Zone 1 Hazardous Locations. They have the following markings:

AEx e IIB+H2 T3 Gb,  
Ex e IIB+H2 T3 Gb,  
Class I, Zone 1, IIC T3 ;  
Class II, Div. 2, Groups EFG, T3

Class II Zone 21 dust marking and T4 marking available on request

Conforms to UL Std.60079-0, UL Std. 60079-7, UL Std. 60079-31, ANSI/UL Std. 499  
Certified to CAN/CSA Std. C22.2 No.60079-0, CAN/CSA C22.2 No.60079-7,  
CAN/CSA Std. C22.2 No.60079-31, CAN/CSA C22.2 No.130



**InteliHeat CID2:**



The Protherm Class I Division 2 range of heating jackets are available for many container sizes as well as virtually any custom size. Available in many power and temperature options, they have the following markings:

- Class I, Division 2, Groups ABCD, T3
- Class II, Division 2, Groups EFG, T3
- Class I, Zone 2, IIC, T3
- Class II, Zone 22, IIIB, T3
- Class III, Division 1 and 2, T3

T4 marking available on request

Conforms to ANSI/UL Std. 499, ISA Std. 12.12.01  
Certified to CAN/CSA C22.2 No.130



## NEC 500 / NEC 505

The National Electric Code defines Hazardous Locations according to 2 different standards; NEC 505 and NEC 500. NEC 505 defines the Zone System and NEC 500 defines the Division System.

Comparison Between Zones and Classes/Divisions		
Standards	NEC 505	NEC 500
Atmosphere		
Gases, Vapors	Zone 0	Class I Division 1
	Zone 1	
	Zone 2	Class I Division 2
Dusts	Zone 20	Class II Division 1
	Zone 21	
	Zone 22	Class II Division 2

It is important to note that these two systems are separate. However, as seen in the chart below, some comparisons can be made.

AREA CLASSIFICATION			
CLASS I - FLAMMABLE MATERIAL			
	PRESENT CONTINUOUSLY	PRESENT INTERMITTENTLY	PRESENT ABNORMALLY
IEC/EU	ZONE 0	ZONE 1	ZONE 2
USA NEC 505 & 500	ZONE 0	ZONE 1	ZONE 2
	DIVISION 1		DIVISION 2
CANADA CEC SECTION 18 & ANNEX J	ZONE 0	ZONE 1	ZONE 2
	DIVISION 1		DIVISION 2

By direct comparison of NEC 500 and 505, you can see that Zone 2 is equivalent to Division 2 (InteliHeat CID2 is marked as both). Some products are certified to Zone 1, this extends our level of protection into Division 1. The Zone classification system divides Division 1 into two zones. Zone 0 is generally only considered for mining applications, underground, or for very high concentrations of explosive gas that occur continuously. Therefore, where most industrial applications state Division 1, it will be equivalent to our Zone 1 certification. The final decision should rest with the user's risk assessment of the area in question.



## **NEC 505 defines the following:**

### Zone Definitions

A place in which an explosive atmosphere in the form of a gas/vapor (or cloud of combustible dust) in air...

#### Zone 0 (Zone 20)

...is present continuously, or for long periods or frequently.

#### Zone 1 (Zone 21)

...is likely to occur in normal operation occasionally.

#### Zone 2 (Zone 22)

...is not likely to occur in normal operation but if it does occur, will persist for only a short period.

## **NEC 500 defines the Division System:**

### Class/Division Definitions

Class I – Contains flammable gasses or vapors in quantities large enough to produce an explosion.

Class II – Is hazardous due to the presence of combustible dust in the air.

Class III – Contains easily ignitable fibers or flyings in the air. However, the quantity of fibers and flyings suspended in the air are not likely to be large enough to cause an explosion.

Division 1 – There is a high probability of an explosive atmosphere in normal operation. This can be for part of the time, up to all the time.

Division 2 – There is a low probability of an explosive atmosphere present during normal operation.



## Marking Explanations

The gas group IIC and the temperature classification T3 indicate that both the Thermosafe® and the Faratherm® may be used with all of the listed gases in each of the temperature classification categories T1, T2, and T3 and correlate to NEC 500 Gas Groups A through D.

The 170°C marking for the Thermosafe® indicates that this equipment will not exceed this temperature under normal operating conditions (includes 10% over-voltage and 104°F(40°C) ambient). The equivalent maximum temperature marking is 200°C for the Faratherm® product. It is important to note that when determining which temperature classifications are appropriate for the area of use, reference should be made to the auto-ignition temperature of the gasses present, rather than the flash point. These NEC 505 temperature classifications directly correlate to the temperature classifications outlined in NEC 500. Please see the charts below:

HAZARDOUS ATMOSPHERE CATEGORY (GAS OR DUST GROUPING)				
Explosive Atmosphere	Typical Hazard Material	North America NEC 500 - 503 / CEC 18		NEC 505 / CEC 18
		Hazard Category	Grouping	Gas Grouping
Gases and Vapors	Acetylene	Class I	Group A	IIC
	Hydrogen	Class I	Group B	IIC or IIB + H2
	Ethylene	Class I	Group C	IIB
	Propane	Class I	Group D	IIA
Dusts	Metal Dust	Class II	Group E	-
	Coal Dust	Class II	Group F	-
	Grain Dust	Class II	Group G	-
Fibers and Flyings	Wood, Paper, or Cotton Processing	Class III	-	-

The following table give details of the types of gasses found in each group and their corresponding T-rating.

### COMBUSTION TEMPERATURES OF GASES, VAPOURS AND GROUPS

Combustible gases and vapors are divided into classes according to their ignition temperature and into groups according to their explosive capacity. Markings on motors and other electrical equipment with the symbols used to indicate the production mode, the enclosure group, and the temperature class, indicate the zone in which such equipment can be installed.

Classification of the more common combustible gases and vapours according to temperature class and group

Group	Temperature classes					
	T1	T2	T3	T4	T5	T6
<b>I</b>	Methane (firedamp)					
<b>IIA</b>	Acetic Acid Acetone Ammonia Benzole Benzene Butanone Carbon Monoxide Ethane Ethyl acetate Ethyl chloride Methane Methanol Methyl acetate Methyl alcohol Methyl chloride Naphtalene Propane Toluene Xylene	Acetic anhydride l amyl acetate n butane n butyl alcohol Amylic alcohol Butyl acetate Cyclohexanon Ethyl alcohol Iso butylic alcohol Liquified gas Natural gas Propyl acetate	Cyclohexane Cyclohexanal Decano Diesel fuels Gasoline Heating oil Heptane Hexane Jet fuels Pentane *Petroleum	Acetaldehyde Ether		
<b>IIB</b>	Coke-oven gas Water gas (carburetted)	1,3 butadiene Ethylene Ethylbenzene Ethylene oxide	Hydrogen sulfide Isoprene *Petroleum	Ethyl ether		
<b>IIC</b>	Hydrogen	Acetylene				Ethyl nitrate

Source: <http://www.poweroilandgas.com/2011/07/atex-iec-reference-for-explosive.html>



Explanation of T-rating temperatures

## Temperature Classification

Maximum Surface Temperature	IEC NEC® 505	NEC 500 - Table 500.8(C)
450°C (842°F)	T1	T1
300°C (572°F)	T2	T2
280°C (536°F)		T2A
260°C (500°F)		T2B
230°C (446°F)		T2C
215°C (419°F)		T2D
200°C (392°F)	T3	T3
180°C (356°F)		T3A
165°C (329°F)		T3B
160°C (320°F)		T3C
135°C (275°F)	T4	T4
120°C (248°F)		T4A
100°C (212°F)	T5	T5
85°C (185°F)	T6	T6

Source: <http://www.poweroilandgas.com/2011/07/atex-iec-reference-for-explosive.html>

