

# ELECTRIC HEATER

THE KEY TO THERMAL AND PROCESS HEATING



With extensive years of expertise in Electric Process Heating, our professional team has been designing and manufacturing reliable and certified electric heaters for application in various industries.

Whether you need a custom-engineered or an industrial standard electric heater, our team has you covered.

## ELECTRIC HEATING SERIES

### **VoltMatic**<sup>™</sup> [Low Voltage Heater Series]



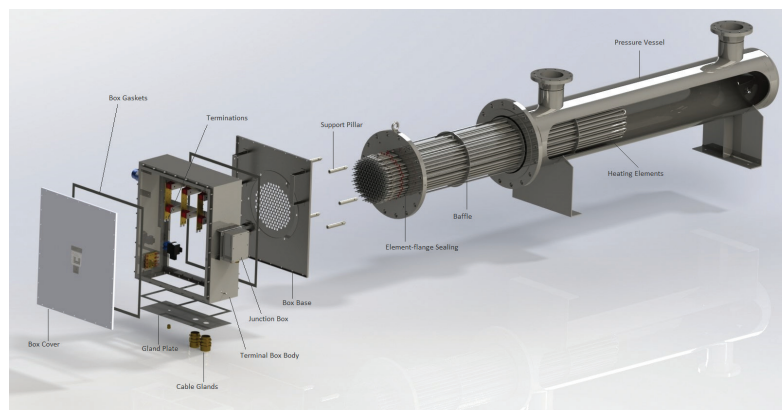
- Powered from 120V~690V AC
- Up to 5000 KW in a single bundle
- Zone 1 IIA/IIB/IIC T1~T6 & IIC T85°C...T450°C
- Cartridge heater, L-Shape heater, Dog-leg heater, etc. available
- Thyristor/Contactor Panel (Safe Area IP42/IP54, Exd/Exp IP66)

### **VoltPro**<sup>™</sup> [Medium Voltage Heater Series]



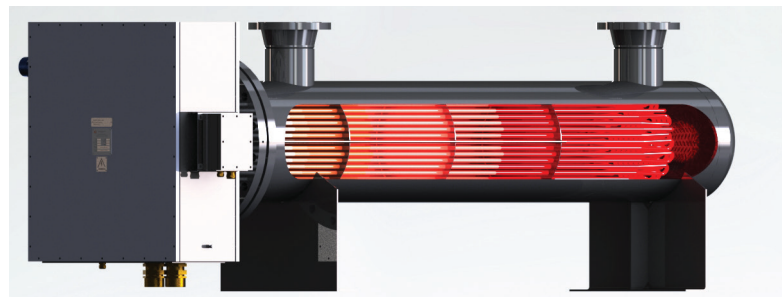
- Powered from 3300V~6600V AC
- 500 ~ 20,000 KW
- Zone 1, Gas Group IIA/IIB/IIC T1~T6
- Thyristor/Contactor Panel (Safe Area IP42/IP54)

## ELECTRIC HEATING SYSTEM



### Process Heater

The Electric Process Heater is usually used to provide direct heating to the process. The heating elements are in direct contact with the process to heat up the cold inlet fluids and maximise the heat transfer by optimising baffle design while limiting pressure drop to the outlet nozzle.



With our proprietary software CALCPEX and other professional design software such as ASPEN and HTRI, we can customise the design of the process heater and system to meet the process demand with duty regulated by Thyristor and/or Contactor using hardwired or PLC controlled.

### Applications

- Reboiler Heater (Natural Gas and CO2 Dehydration)
- Molecular Sieve Regeneration Heater
- Hydrogen, Nitrogen and other gases
- Continuous Catalyst Reforming Unit (CCR) Heater
- Electric Steam Boiler
- Steam Super-heater

- ▣ Liquid to Gas Vaporiser
- ▣ Thermal (Hot) Oil Heater
- ▣ Industrial Gases
- ▣ Fuel Gas
- ▣ Seal Gas Heater

## Tank Immersion Heater



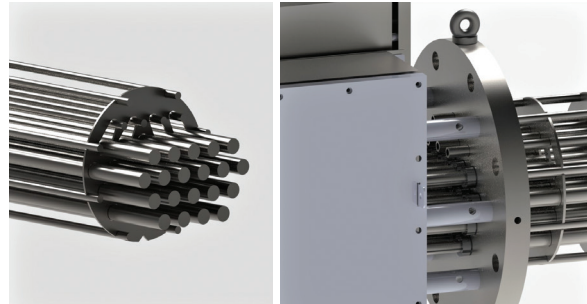
Immersion heating is used to heat up and/or maintain the medium in the tank for application such as bitumen, crude oil, condensate, or CIP use in Seawater Treatment.

*The medium can be in the form of condensate, bitumen, chemical, or any sludge collected in the sump tank.*

## Cartridge Heater (withdrawable)

Besides the conventional design, the heater can be designed with withdrawable elements, which allow replacement of heating elements without draining the tank to offer quicker turnaround time.

DFINITI unique design can reduce the downtime by more than 50%.



## Vaporiser



This relates to cryogenic applications where the heater will

heat the very low-temperature liquid and vaporise it. The vaporised gas can then be further heated by a gas heater in the second stage of heating to the desired temperature.

Due to exposure to a very low temperature process, the heating element is designed to low heat flux for direct heating. Alternatively, indirect heating solutions such as a Bath Heater can be used.

*[Refer to our Bath Heater brochure for more details about indirect heating.]*

## Applications

- ▣ LPG/LNG, Liquid Hydrocarbon, etc.

## L-Shape and other shapes of Heaters

For underground tank design where the only access is from the top, an L-shape or a dog-leg shape heater can be provided.



## Applications

- ▣ Condensate Heater
- ▣ Separator Tank Heating
- ▣ Crude Oil Heater
- ▣ Produced Water Heater
- ▣ Caustic Water in CIP Tank
- ▣ Bitumen Heating in Storage Tank
- ▣ Thermal Liquids Heating

## Technical Data

**Supply Voltage**

Max 690VAC 50/60Hz

**Certifications**

ATEX, IECEx, UL and Inmetro

**Power**

Up to 5000KW in a single unit

## Certification and Standards

Our Electric Process Heaters are certified with ATEX, IECEx, UL and Inmetro, suitable for Zone 1, Zone 2, and Class 1 Div 2, Class 1 Zone 2 area classifications. They meet the temperature class, gas group, and ingress protection for most applications in the industries.

Besides product certifications, our facilities are also certified to manufacture ATEX and IECEx products under the QAN and QAR systems, respectively. We are also certified to ASME U Stamp and registered with the National Board.

We manufacture pressure vessels that meet other design standards such as PED, AS and GB as required. For Marine Classification, we certify the products on a project basis to ABS, DNV, BV standards, and alike.



Type	Increased Safety (Exe)	Flameproof (Exd)	UL (Cert)
Standard	EN IEC 60079-7, 60079-0	EN IEC 60079-1, 60079-0 EN IEC 60079-31	UL 50E, UL 499, UL 823
Code	II 2 G, Ex eb Gb	II 2 G/D, Ex db Gb, Ex tb Db	Class I Division 2, Group A, B, C & D
T-class	T1-T16	T1-T6 T85-T450 C	T1-T6
Gas Group	IIA/IIIB/IIIC	IIA/IIIB/IIIC IIIC	A,B, C & D
IP Rating	IP66	IP66	Type 4X (NEMA 4X)

- Element diameter: 12.5mm, 16mm
- Element sheath material: Incoloy 800, 825, SS321, SS304, SS316, Titanium and others

### Heater Flange

- Also known as EIH Support Plate
- Design to ASME Appendix 41

### Pressure Sealing

- Bite-coupling, strength weld or bracing

### Terminal Box

- Exe – Standard SS316 or painted mild steel
- Exd – Standard Carbon Steel or SS on request

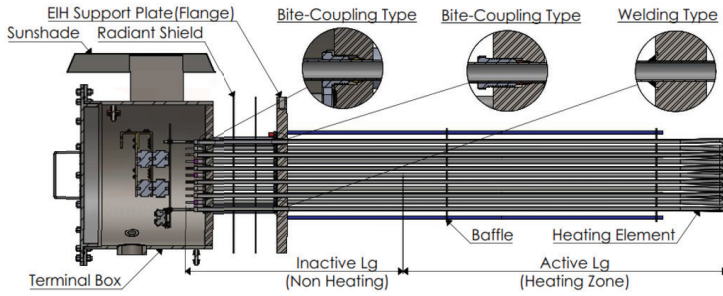
### Over-temperature Protection

- Element over-temperature protection
- T-class protection
- Terminal Box over-temperature protection (optional)

### Heating Element Selection

Item	Considerations	Typical
Heat Flux	Process medium Client Specifications (e.g. DEP, PTS)	TEG: 2.2w/cm <sup>2</sup> , Fuel Gas: 2-7w/cm <sup>2</sup>
Element Material	Temperature exposure NACE	Incoloy 800, SS304, SS321, Incoloy 825

## Heater Construction



### Heating Element

- Tubular Heating element with NiCr 80/20 resistive heating wire compacted with MgO

## Element Tube Construction

Item	<150 Deg. C	150-300 Deg. C	>300 Deg. C
150lbs	Welded	Welded	Seamless
300lbs	Welded	Welded	Seamless
600lbs	Welded	Seamless	Seamless
900lbs and above	Seamless	Seamless	Seamless

### Tube Wall thickness recommendation

Welded tube: min 1.0mm, Seamless tube: min 1.25mm

#### DISCLAIMER

The table is derived based on DFINITI's past experience in dealing with various processes, applications, and clients' specifications and requirements, and it is merely for reference. Specific clients or process licensors may specify seamless tubes regardless of pressure and temperature rating. Seamless tubes are recommended for lethal service applications. DFINITI shall not be responsible or held liable for any losses and damages resulting from adopting the above recommendations without further review of the actual and specific requirement or agreement

## CONTROL PANEL



A Control Panel is installed to the Electric Process Heater to operate the heater throughout the lifespan of the system.

It is therefore important and critical that the Control Panel is designed not only to achieve functional purposes and protection but also smooth operations to prevent disruption to the process and any other undesired incidents.

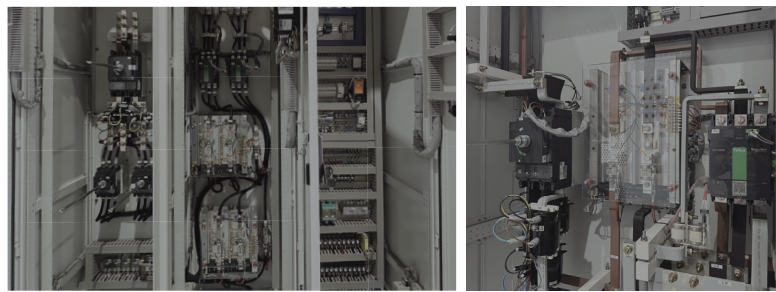
There are two main factors in designing the Control System:

Type of Control	Areas of Installation
<ul style="list-style-type: none"> <li>• On/Off or 0-100% load control</li> <li>• Single stage or multiple stages</li> <li>• PLC or hardware</li> </ul>	<ul style="list-style-type: none"> <li>• Safe area: Indoor (IP42) or outdoor (IP54)</li> <li>• Hazardous area</li> </ul>

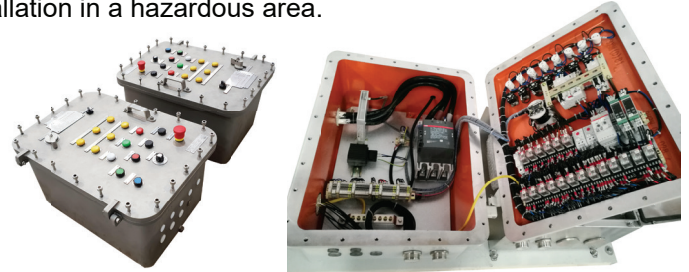
Heaters used in process heating are usually designed to Thyristor controlled which is capable of modulating load from 0-100% on heater output. Due to high heat dissipation from Thyristor switching, the panel is normally housed indoor to avoid excess heating of heat duty within the panel.

Forced fan ventilation is included as a standard for the Thyristor panel. For outdoor installations where the heater duty is big and with high ambient temperature, an air-conditioner may be used if forced fan ventilation is insufficient.

Load control	Thyristor (aka SCR)	
Stage control	Single stage or multiple stages control	
Control logic	Hardwired or PLC	
Functions	<ul style="list-style-type: none"> <li>• Heater On/Off</li> <li>• Duty Control</li> <li>• Local (manual) or Remote (auto)</li> <li>• Duty Selector</li> <li>• Trip Reset</li> </ul>	
Type of Protection	<ul style="list-style-type: none"> <li>• Over-current</li> <li>• Earth fault</li> <li>• Panel over-temperature</li> <li>• Heating element over-temperature</li> <li>• Thyristor over-temperature</li> <li>• ESD</li> <li>• T-class (by design or sensor)</li> <li>• Terminal Box over-temperature (optional)</li> <li>• Shell temperature (optional)</li> </ul> Other protections are available on request.	
Installation	Indoor	Outdoor
IP rating	IP42 or IP44	IP54
Cooling	Forced Fan	Forced Fan or Air-conditioner
MOC	Painted Mild Steel	Painted Mild Steel or SS



Other than Exd panel, purged panel Ex'p' can be offered for installation in a hazardous area.



## Modes of Thyristor Firing

Subject to switching duty and the overall electrical system, there are basically three types of firing modes:

- ▣ Zero Cross-over, Single Cycle Firing
- ▣ Zero Cross-over, Burst Firing
- ▣ Phase Angle Firing

For installation in hazardous areas, the Control Panel is designed with Exd Ex-proof enclosure for a small heater load and/or Contactor controlled where heat dissipation is minimum. These are usually for local Control Panel use in tank immersion heaters.

### Control Mode

Output Level/ Control Signal	Zero Cross (Cycle Sampling)	Zero Cross (Burst Firing/Time Sampling)	Phase Angle
20% Output/ 7.2mA	 1 cycle ON and 4 cycle OFF	 T	
50% Output/ 12mA	 1 cycle ON and 1 cycle OFF	 T	
90% Output/ 18.4mA	 9 cycle ON and 1 cycle OFF	 9 cycle ON and 1 cycle OFF	

### NOTES

1. Phase angle control is not preferred as it generates harmonic. If phase angle is used, Active Harmonic Filter (AHF) shall be used to filter the unwanted harmonic.
2. As the control mode may affect the entire electric system especially a large heater duty, it is advisable to consult DFINITI for the more suitable control mode to suit specific design.

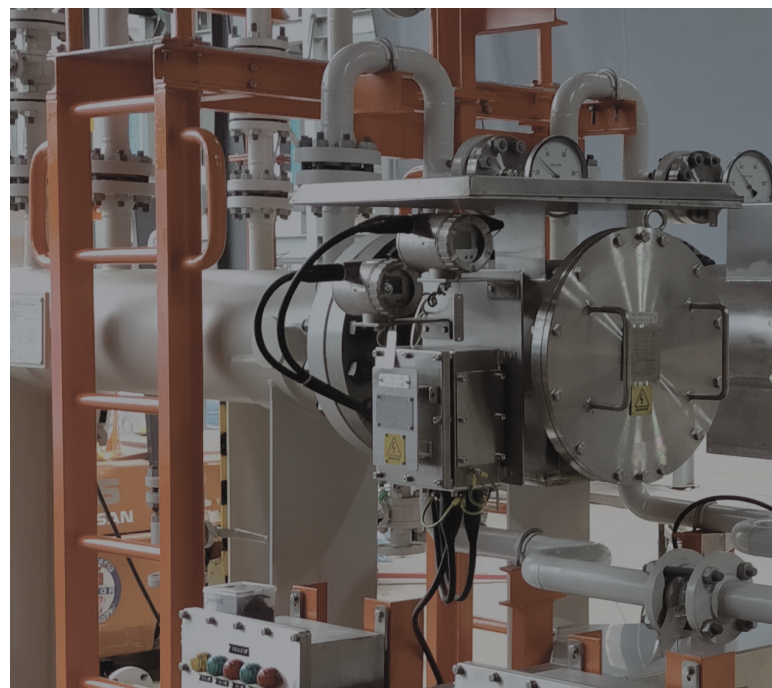
## HEATER SKID PACKAGE

Besides supplying Electric Heater and Control Panel as loose equipment, Dfiniti can integrate these into a skid mounted package.

From integrated unit to standalone for remote application, we can offer Heater Skid Package for various applications.

### Electric Heating System integrated with the following in skid package

- ▣ Pumps, Valves
- ▣ Sensors & Transmitter
- ▣ E&I Components, Cable Tray
- ▣ Piping, Skid Frame and Structure



## HOT WATER CALORIFIER



A Hot Water Calorifier is akin to the hot water heater at home. It is used for hot water supplies to the living quarters, mainly in offshore applications. Our advantage is being able to supply complete products with an in-built heater.

<b>Design Code</b>	ASME VIII Div 1 PED, AS1210 or other relevant codes
<b>Element Material</b>	SS316L, Incoloy, etc.
<b>Tank Material</b>	SS316/316L

## ELECTRIC STEAM BOILER

DFINITI provides single Electric Boiler or package includes deaerator, pumps and condensate recovery. Medium Voltage Electric Boiler is also available.



## AIR DUCT HEATER



DFINITI can customised the duct heater to suit the ducting size and at orientation to suit any installation constraint. Heating element can be tubular or finned type for high thermal efficiency, housed in a robust enclosure to reduce vibration and noise.

It is suitable for various applications as follow:

- Air Separation Unit
- Drying Air
- For comfort in living quater during winter
- ATEX/IECEX certified Duct Heaters are available

Optimizing your heating processes is essential for improving efficiency and reducing operational costs. At Dfiniti, we specialize in providing innovative heating solutions tailored to your unique needs. Our expert team is dedicated to helping you streamline your heating systems, ensuring optimal performance and reliability.

Whether you're looking to enhance energy efficiency, improve process control, or reduce downtime, we have the tools and expertise to guide you every step of the way. Our solutions not only meet the highest industry standards but are also designed to adapt to your evolving requirements.



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