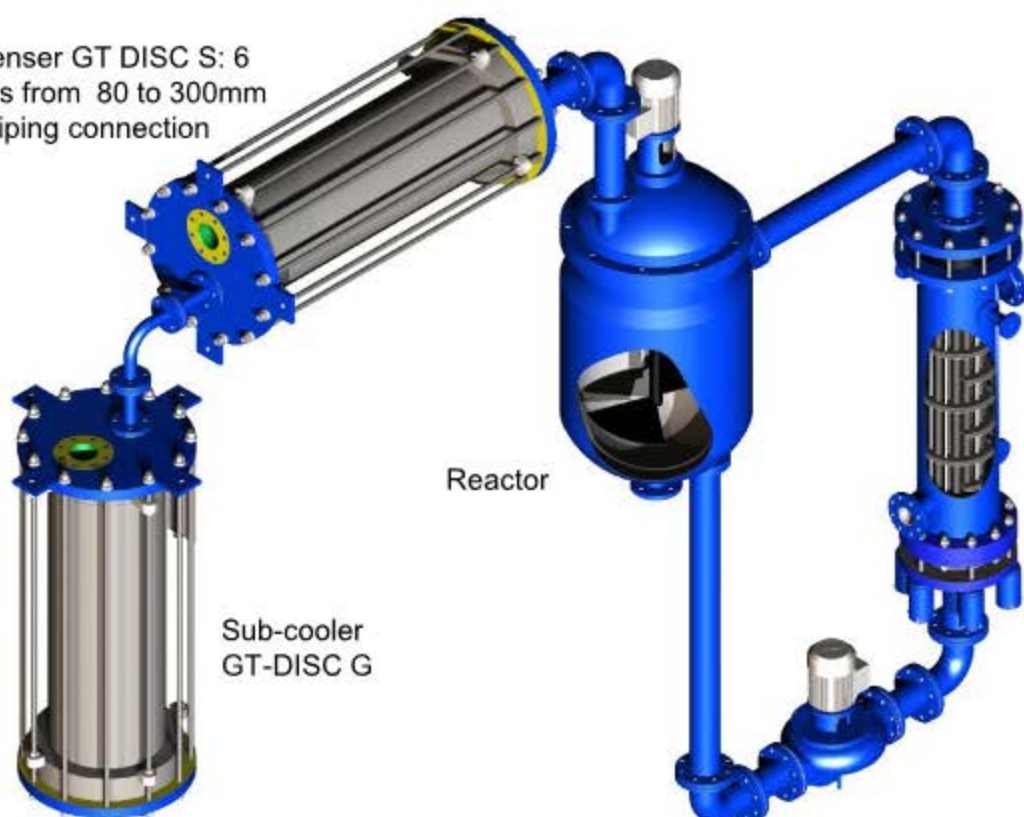


# Improved solutions for corrosives processes with Graphite Technologies

## PHARMACEUTICAL & FINE CHEMICAL

### CONDENSERS & SUB-COOLERS

Condenser GT DISC S: 6  
models from 80 to 300mm  
inlet piping connection



Forced circulation  
heater : custom  
designed from  
5KW to 2MW  
(refer to our  
brochure for other  
type of heat  
exchanger)

#### GT-DISC heat exchangers

in GT-KELITE  
in GT-KELITE+  
in GT-FLON  
In GT OXY FLON  
in GT-FLON PHARMA  
in GT-CARB+



Graphite Technology

[www.graphite-technology.com](http://www.graphite-technology.com)

## **GT-DISC S, the complement and alternative to high nickel alloys, Tantalum, Titanium traditional graphite for corrosive applications.**

### **Main markets**

- Pharmacy (API)
- Fine chemical (fragrance, flavors, )
- Agro chemical (pesticide, herbicide, fertilizer)

### **Main applications**

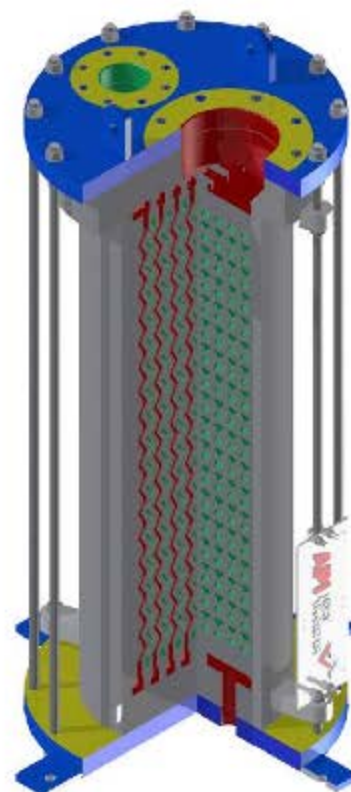
- Condensation of reactors vapors
- Subcooling of condensate
- Economizer

### **Features :**

- Reduced components for easy maintenance.
- Reduced fouling due to low surface energy
- Horizontal or vertical position
- Design up to 10 barg / 500°C
- Design in accordance to EN13445 or ASME or GB150 codes of construction.
- Modular design to extend or reduce capacity / footprint
- No sensitive to thermal shock (GT FLON, GT CARB+ grade)
- No sensitive to solvents (GT FLON, GT CARB+ grade)
- Easy opening, cleaning, reassembly.
- Standard gasket for all models
- Corrosion resistant on both sides (economizer)
- Standard parts with fast delivery.
- Low pressure drop.
- Extremely efficient for condensation, auto dry surface.
- Equipment easily customized (send us your operating data's and requirement)
- Low footprint
- Lab scale equipment available
- Gaskets in pure PTFE or FKM/FFKM.

### **In option :**

- Steel parts in stainless steel 304 or 316L
- Clean In Place device
- Sight glass for in situ inspection and swab test
- GT FLON PHARMA, FDA compliance
- Fluorolined, fluorocoated or glass lined flanges
- Full access process side
- HAMMER PROOF, water hammer protection device
- GT OXY FLON, for extremely high oxidative media
- Fully drainable
- Equipment supplied with comprehensive pharmaceutical documentation based on Good Documentation Practice.
- Assembly without gaskets



### **Differences with competitions**

"user friendly" unique equipment design. Allow harshest operating conditions and extended lifetime.

- HAMMER PROOF® against water / steam hammering
- STABLE LOAD® against stress fatigue due to thermal cycling
- STRESS FREE® against piping stress
- FILT-IN® against dirt fouling from cooling media
- High thermal shock resistance
- Modular design with discs stacked to achieve the desired heat transfer area.
- Unique grades of materials adapted for fine chemical and pharmaceutical





## GT-DISC S: examples of thermal sizings

Example of typical configuration of condensers for glass lined reactors using water as main media

| Model       | HTA               | Reactor volume    | Av. water vapor flow | Av. power | Equipment footprint |        |        | Process nozzle |        | Service nozzle |        |
|-------------|-------------------|-------------------|----------------------|-----------|---------------------|--------|--------|----------------|--------|----------------|--------|
|             |                   |                   |                      |           | Diam.               | Height | Weight | Inlet          | Outlet | Inlet          | Outlet |
| (-)         | (m <sup>2</sup> ) | (m <sup>3</sup> ) | (kg/h)               | (kW)      | (mm)                | (mm)   | (kg)   | (DN)           | (DN)   | (DN)           | (DN)   |
| 3-20x8-8x8  | 1.0               | 0.25              | 100                  | 63        | 435                 | 1,102  | 238    | 80             | 25     | 50             | 50     |
| 4-20x8-8x8  | 3.5               | 2-3               | 500                  | 315       | 530                 | 1,282  | 404    | 125            | 25     | 80             | 80     |
| 5-50x8-8x8  | 7.0               | 4-6               | 600-800              | 500       | 600                 | 1,222  | 499    | 150            | 25     | 100            | 100    |
| 6-50x8-8x8  | 10.8              | 6-8               | 1000-1400            | 850       | 650                 | 1,162  | 554    | 200            | 40     | 125            | 125    |
| 7-20x10-8x8 | 18.5              | 16-20             | 2000-2500            | 1,500     | 750                 | 1,202  | 720    | 250            | 50     | 150            | 150    |
| 8-50x10-8x8 | 28.8              | 32-40             | 3000-3500            | 2,200     | 850                 | 1,242  | 926    | 300            | 50     | 200            | 200    |

### Typical data :

- Reactors heated with jacket.
- Condensation at atm.pressure
- Cooling water at 20°C,  $\Delta T = 10^\circ\text{C}$
- LMTD = 75 °C

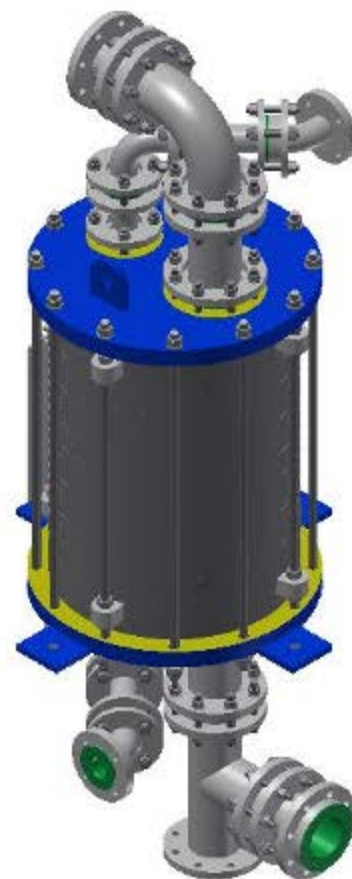
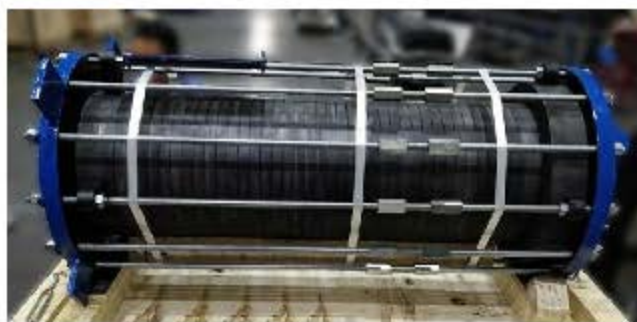
Example of typical configuration of condensers for glass lined reactors using methanol as main media

| Model       | HTA               | Reactor volume    | Av. methanol vapor flow | Av. power | Equipment footprint |        |        | Process nozzle |        | Service nozzle |        |
|-------------|-------------------|-------------------|-------------------------|-----------|---------------------|--------|--------|----------------|--------|----------------|--------|
|             |                   |                   |                         |           | Diam.               | Height | Weight | Inlet          | Outlet | Inlet          | Outlet |
| (-)         | (m <sup>2</sup> ) | (m <sup>3</sup> ) | (kg/h)                  | (kW)      | (mm)                | (mm)   | (kg)   | (DN)           | (DN)   | (DN)           | (DN)   |
| 3-20x8-8x8  | 1.5               | 0.25              | 100                     | 31        | 435                 | 1,945  | 358    | 50             | 25     | 25             | 25     |
| 4-20x8-8x8  | 5.9               | 2-3               | 500                     | 150       | 530                 | 1,945  | 549    | 125            | 25     | 65             | 65     |
| 5-50x8-8x8  | 12.1              | 4-6               | 600-800                 | 244       | 600                 | 1,824  | 658    | 125            | 25     | 80             | 80     |
| 6-50x8-8x8  | 14.5              | 6-8               | 1000-1400               | 430       | 650                 | 1,945  | 883    | 150            | 25     | 100            | 100    |
| 7-20x10-8x8 | 33.6              | 16-20             | 2000-2500               | 760       | 720                 | 1,824  | 1,051  | 200            | 50     | 150            | 150    |
| 8-50x10-8x8 | 48.0              | 32-40             | 3000-3500               | 1070      | 850                 | 1,684  | 1,167  | 250            | 50     | 150            | 150    |

### Typical data :

- Reactors heated with jacket.
- Condensation of methanol at atm.pressure
- Cooling water at 20°C,  $\Delta T = 8^\circ\text{C}$
- LMTD = 40 °C

- Request our Excel file tool for quick sizing estimation by your own.
- Nozzles and footprint could be customized on request.
- Sizing of sub-cooler of condensate require your operating data.



GT-DISC exist in 2 designs

- Annular groove well adapted for small flows, high fouling or high viscous media (GT-DISC G)
- Disc slots for higher flow and extremely high condensation heat transfer (GT-DISC S).



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**GT-DISC G, the complement and alternative to high nickel alloys, Tantalum, Titanium traditional graphite for corrosive applications.**

**Main markets**

- Pharmacy (API)
- Fine chemical (fragrance, flavors, )
- Agro chemical (pesticide, herbicide, fertilizer)

**Main applications**

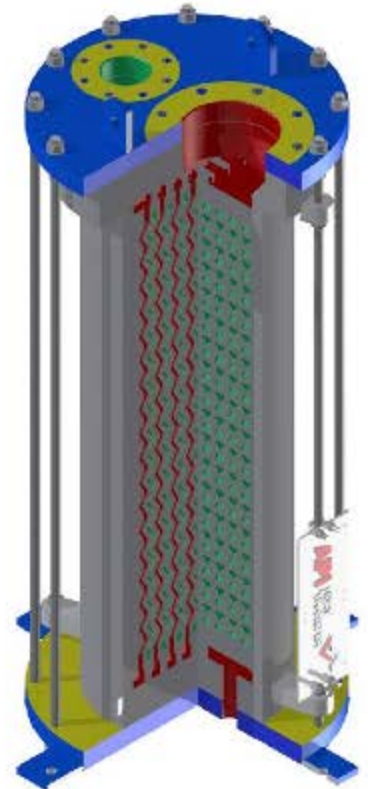
- High viscosity media heating or cooling
- High fouling media heating or cooling

**Features :**

- Reduced components for easy maintenance.
- Reduced fouling due to self cleaning design
- Horizontal or vertical position
- Design up to 10 barg / 500°C
- Design in accordance to ASME, EN13445 or GB150 codes of construction.
- Modular design to extend or reduce capacity / footprint
- No sensitive to thermal shock (GT FLON, GT CARB+ grade)
- No sensitive to solvents (GT FLON, GT CARB+ grade)
- Easy opening, cleaning, reassembly.
- Standard gasket for all models
- Corrosion resistant on both sides (economizer)
- Standard parts with fast delivery.
- Extremely efficient for dirt and media with particles, slurries, auto dry surface.
- Equipment easily customized (send us your operating data's and requirement)
- Low footprint
- Lab scale equipment available
- Gaskets in pure PTFE or FKM/FFKM.

**In option :**

- Steel parts in stainless steel 304 or 316L
- Clean In Place device
- Sight glass for in situ inspection and swab test
- GT FLON PHARMA, FDA compliance
- Fluorolined, fluorocoated or glass lined flanges
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- GT OXY FLON, for extremely high oxidative media
- Fully drainable



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- Modular design with discs stacked to achieve the desired heat transfer area.
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## Outstanding corrosion resistant materials

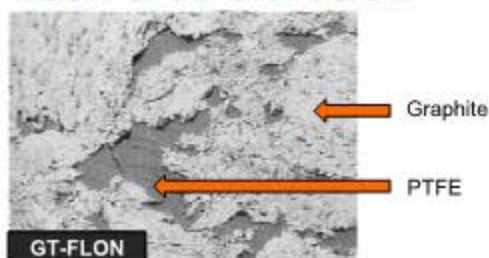
### "Real" multipurpose materials

Our PTFE with graphite materials are ;

- non-sensitive to solvent swollen unlike competitors using graphite with phenolic resin.
- non-corroded by most chemical media unlike graphite with phenolic resin of competition. Thionyl chloride, hydrofluoric acid, chlorine can be handled.

Unlike metals, corrosion resistance is not altered by contaminants (chlorides, fluorides,...). Spectrum of media much wider than metals.

### GT FLON & GT OXY FLON



Micrograph of impregnated graphite structure (x1000)

GT-FLON and GT OXY FLON show extraordinary corrosion properties outclassing traditional phenolic resin impregnated graphite.

Typical severe application examples

| Media                                 |                           | Conc. up to (%) | Temp up to (°C) |
|---------------------------------------|---------------------------|-----------------|-----------------|
| HF                                    | hydrofluoric acid         | 100%            | 200°C           |
| HNO <sub>3</sub>                      | nitric acid               | 40%             | 150°C           |
| H <sub>2</sub> SO <sub>4</sub>        | sulfuric acid             | 95%             | 180°C           |
| HBr                                   | hydrobromic acid          | 100%            | 200°C           |
| HCl                                   | hydrochloric acid         | 100%            | 200°C           |
| H <sub>3</sub> PO <sub>4</sub>        | phosphoric acid           | 100%            | 200°C           |
| NH <sub>4</sub> Cl                    | ammonium chloride         | 100%            | 200°C           |
| CaCl <sub>2</sub>                     | calcium chloride          | 100%            | 200°C           |
| CuCl <sub>2</sub> , CuSO <sub>4</sub> | cupric chloride & sulfate | 100%            | 200°C           |
| FeCl <sub>3</sub>                     | ferric chloride           | 100%            | 200°C           |
| KOH, NaOH                             | caustic potash & soda     | 100%            | 200°C           |

| Material                                     | Operating temp. | Adapted for...  | Wear  |
|--|-----------------|---|---|
| GT FLON /<br>GT FLON PHARMA /<br>GT OXY FLON | -60 / 300°C     | Most chemical media, all solvents. Thermal cycling, batch processes. Oxydative media.       | No wear up to 1.5-1.7 m/s (liquid) and 25 m/s (gas) |
| GT KELITE /<br>GT KELITE+                    | -60 / 200°C     | Low temperature, low ΔT service/process, continuous process, process without solvent.       | No wear up to 2.0 m/s (liquid) and 30m/s (gas).     |
| GT CARB+                                     | -60 / 1300°C    | Extremely high temperatures (up to 1300°C without oxydizing media). Strong thermal cycling. | No wear up to 1.5-1.7 m/s (liquid) and 25 m/s (gas) |

Our PHARMA grade materials comply with ;

FDA Regulation and Norms for Food Contact Substance (FCS) Migration = As per the document - Guidance for Industry – Preparation of Food Contact

Notifications and Food Additive Petitions for Food Contact Substances: Chemistry Recommendations.

Food Additive regulated for its intended use as per 21 CFR 173 – 178 – exempted from regulation under Threshold of Regulation Process as per 21 CFR 170.39.

Identification of Types of foods expected to be used in contact with FCS and maximum temperature and time condition of food contact as per 21 CFR 176.170.

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