

# UltraHeat™ Plate and Frame Heat Exchangers

Engineered for Excellence



**GRAHAM**  
ENGINEERING ANSWERS



Graham engineers analyze  
your specific vacuum and  
heat transfer requirements to  
maximize the efficiency and  
performance of your process.

Because it's not just about  
engineering products, it's about  
**engineering answers.**

Graham Corporation traces its history to the earliest development of heat transfer products in the United States during the 1920s, when the foundation was established for the engineering of heat transfer equipment. Incorporated in 1936, Graham designed and built some of the first shell and tube heat exchangers ever made.



In 1943, Graham patented the Heliflow<sup>®</sup> heat exchanger, which uses a coiled tube that provides higher durability than other designs, even in the most severe operating conditions. Graham engineers recognized the extreme efficiency of a pressed corrugated heat transfer plate and began creating and producing plate heat exchangers in 1970.

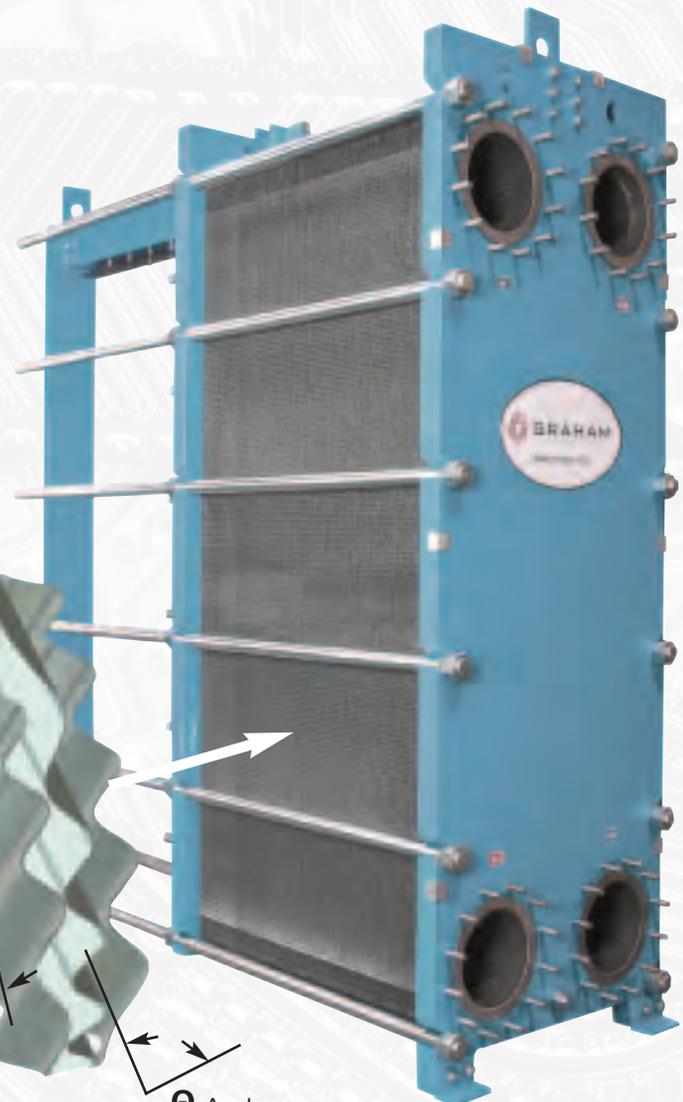
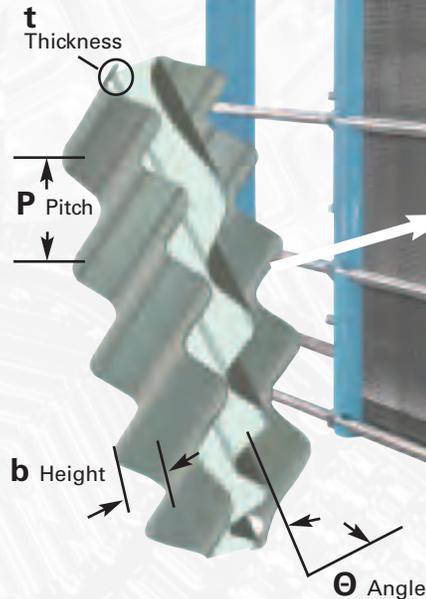


Through such forward thinking and relying on over 65 years of heat transfer experience, Graham continues to build tomorrow's answers through today's vision and leadership in engineering and quality.

## Designed for performance and reliability

In developing a line of plate heat exchangers, Graham engineers analyzed the factors that contribute most to the success of plate heat transfer and incorporated them into the UltraHeat<sup>™</sup> plate heat exchanger line. The plate geometries for UltraHeat plate exchangers were carefully chosen after examining various plate depths, patterns and angles to maximize heat transfer, hydraulic performance and pressure ratings.

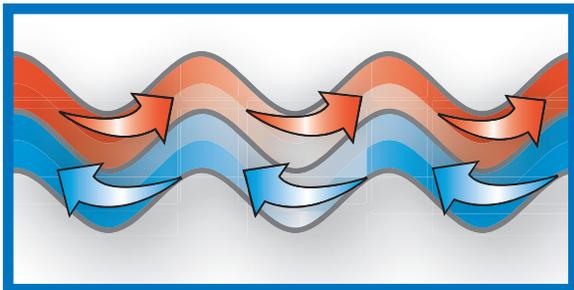
UltraHeat plates are specially designed with deep gasket grooves that securely hold gaskets in place, rigid corrugations and integral alignment features to guarantee trouble-free operation under a variety of operating conditions. The result is that UltraHeat plate geometries offer superior efficiency or optimum functionality, depending on the application requirements.



## How the UltraHeat works

The UltraHeat plate heat exchanger is an assembly of thin metal heat transfer plates with mechanically formed corrugations that distribute fluid flow and form a perimeter gasket groove for fluid retention. The corrugated pattern creates high fluid turbulence, resulting in high heat transfer coefficients and smaller surface areas. A true counter-current flow is produced, allowing temperature approaches to within 1° F of the opposing fluid and heat recovery in excess of 96 percent to be technically and economically feasible.

The governing factor in determining the size of a heat exchanger is to determine the surface area required to transfer the specified heat from one fluid to another. Because the heat transfer duty ( $Q = \text{Btu/hr.}$ ) and the log mean temperature difference (LMTD, °F) are fixed, the driving factor in deciding on the surface area or size is the overall heat transfer coefficient  $U$  (Btu/sq.ft. °F). Therefore, as the  $U$  value increases, the surface area becomes smaller, reducing both the size and the cost of the heat exchanger.



$$\text{Surface Area} = \frac{Q}{U \times \text{LMTD}}$$

$Q$  = Heat transfer duty

$U$  = Overall heat transfer coefficient

LMTD = Log mean temperature difference

$$= \frac{(T_{\text{hot in}} - T_{\text{cold out}}) - (T_{\text{hot out}} - T_{\text{cold in}})}{\ln \left( \frac{T_{\text{hot in}} - T_{\text{cold out}}}{T_{\text{hot out}} - T_{\text{cold in}}} \right)}$$

## Advantages of the UltraHeat

Plate and frame exchangers provide the highest efficiency mechanism for heat transfer available in the industry today. Graham UltraHeat plate heat exchangers offer several advantages over others on the market, including:

- **Economical, Low-capital Investment:** The UltraHeat plate heat exchanger uses specially designed heat transfer plate geometries and extremely turbulent flow to yield the most efficient high heat transfer rates with the least required surface area. By employing pure counter-flow for closer temperature approaches, the UltraHeat plate heat exchanger offers maximum energy recovery with a low operating cost. Capital costs can be as much as 75 percent less than other types of heat exchangers.
- **Easy to Install:** Because all the connections are located in the same plane and only three mounting points are required, installation is straightforward. Piping and setup are quick and inexpensive.
- **Heavy-duty:** The UltraHeat plate heat exchanger uses thicker pressure retaining heads and larger bolt diameters to guarantee trouble-free heat exchanger operation and sealing. Thermal plates are designed with a maximum number of contact points where possible for higher pressure ratings and greater durability.
- **Low Maintenance Costs:** The turbulent flow across the heat exchanger plate minimizes – and in some cases eliminates – fouling. If maintenance or plate replacement is required, the all-bolted construction means less labor and downtime.
- **Compact, Modular Design:** The small size of the UltraHeat plate heat exchanger results in 75 percent less volume than other heat exchangers. This means lower coolant costs, more precise temperature control, reduced weight and easier drainage. It also means less floor space is required, making it ideal for skid-mounted packages.



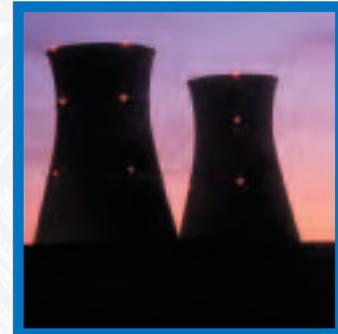
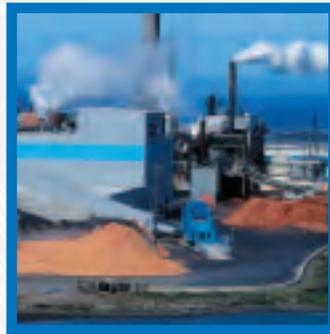
# The right plate heat exchanger for your job

The Graham UltraHeat gasketed plate heat exchanger line is engineered for optimum performance in any given application. Whether the goal is to maximize heat recovery from a warm water stream to a cold one or to cool even the most viscous of slurries, Graham engineers can custom design an UltraHeat plate exchanger configured to your specific needs.

UltraHeat plate heat exchangers are ideal for the following:

## ***HVAC Applications***

- **Water Heaters:** Using steam or high temperature water, Graham UltraHeat plate heat exchangers are an excellent choice for heating potable water or other fluids. The high heat transfer rate and corrosion resistance of stainless steel plates make these units uniquely suited for heating service.
- **Cooling Tower / Heat Pump Isolation:** The high turbulence of a Graham UltraHeat plate heat exchanger minimizes fouling in independent cooling tower systems. Should a plate become plugged, it can be easily disassembled and cleaned. In addition, the plate exchanger can be used to protect the heat pump from contaminants in the water supply. It maintains a high degree of turbulence that is essential for reducing fouling and maintaining high heat transfer rates.
- **Free Cooling:** When ambient air temperature is cool enough to allow free cooling, the cooling tower water can precool entering air, assist in mechanical cooling or provide total system cooling for the air conditioning system. A Graham UltraHeat plate heat exchanger is an essential part of the design of a free cooling system.



## ***Process Applications***

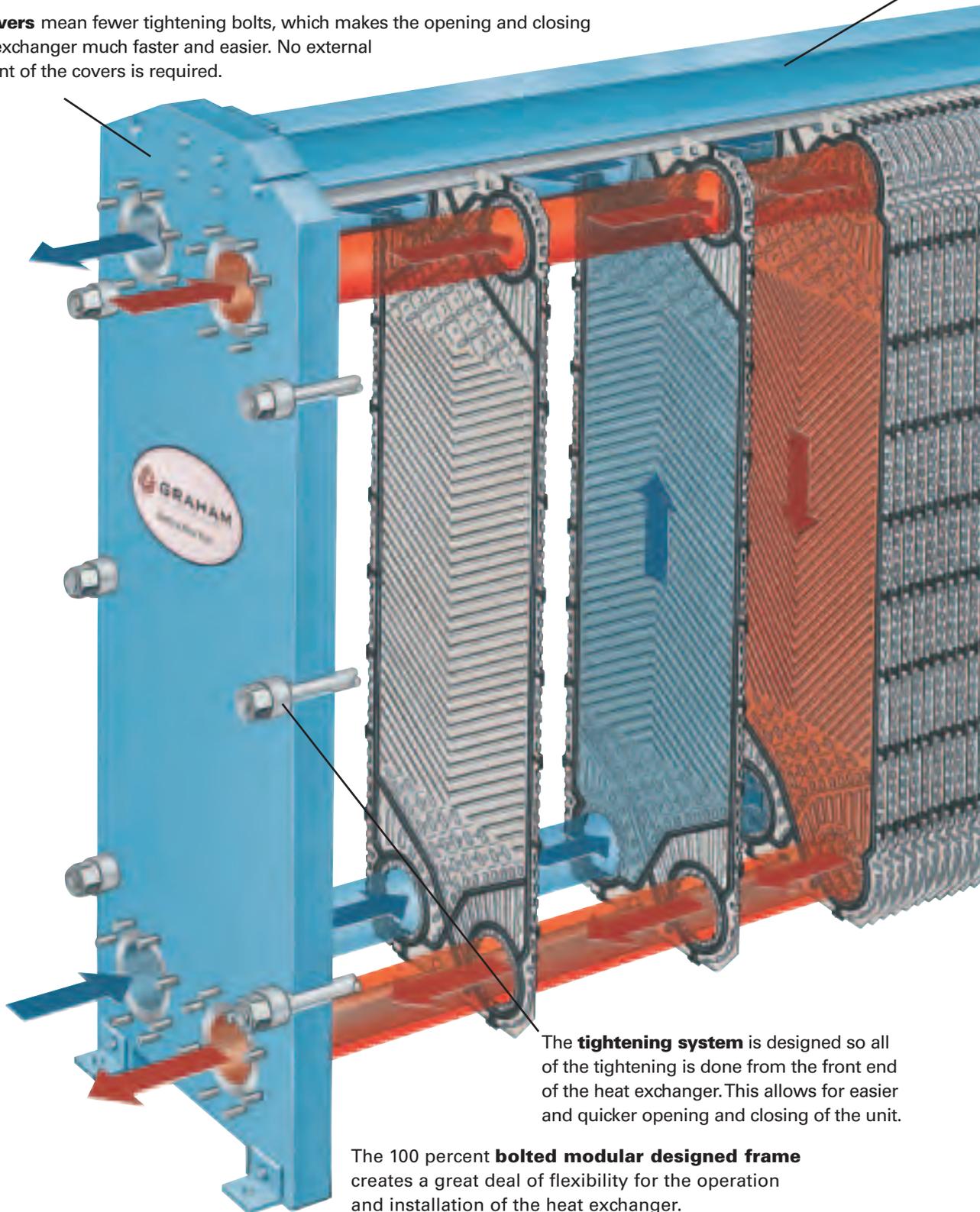
- **Chemical:** The heat transfer plates and gaskets of the UltraHeat are available in a variety of corrosion resistant materials to withstand the most difficult and aggressive conditions. The UltraHeat is ideal for applications such as acid and caustic heating or cooling; amine and other process interchanges; oil, gas and petrochemical refining; heating or cooling with brine; and isolating process water.
- **Industrial:** To eliminate downtime, an industrial process heat exchanger must be efficient, dependable, compact and easy to repair or clean. The UltraHeat plate heat exchanger is all that. For oil and jacket water cooling, paint and metal treatment, closed loop cooling and heat recovery, the UltraHeat is a proven performer.
- **Food and Beverage:** Smooth, trouble-free operation of the heat exchanger is critical for the food process market, which is why the UltraHeat offers a variety of plate chevrons and free-flowing patterns. Whether you are refining sugar, heating or cooling an edible oil or starch, or making beer, the UltraHeat has the ideal plate pattern for the application.

## Features of the frame

The frame for the UltraHeat plate heat exchanger is engineered and built to the highest standard for a long, dependable life under many operating conditions.

**Pressure-retaining covers** are designed with the latest stress calculations per ASME. Thicker heads and larger diameter tightening bolts are used for a heavy-duty construction that results in a more uniform plate pressure and extended gasket life.

**Thicker covers** mean fewer tightening bolts, which makes the opening and closing of the heat exchanger much faster and easier. No external reinforcement of the covers is required.



The **tightening system** is designed so all of the tightening is done from the front end of the heat exchanger. This allows for easier and quicker opening and closing of the unit.

The 100 percent **bolted modular designed frame** creates a great deal of flexibility for the operation and installation of the heat exchanger.

The **plate-carrying bars** form an exact plate alignment system to ensure an optimal seal between plates and gaskets.



All units have a **rear support column** for additional unit strength and integrity.

The **rear pressure retaining cover** is moveable, which allows for easy access to and maintenance of the plate heat exchanger.

A **protective shroud** covers the plates on every heat exchanger. It meets OSHA requirements and protects the plates and gaskets from external damage.

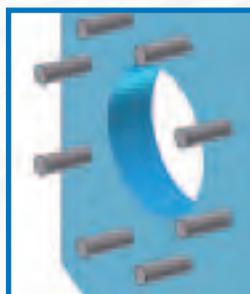
### Connection Types – Standard



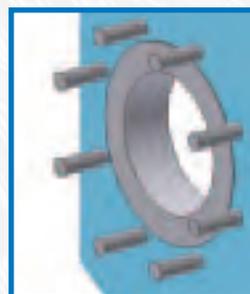
**Threaded (Internal)**



**Threaded (External) Alloy**



**Studded**



**Studded Alloy Lined**

Units are provided with **threaded- or studded-type connections** that are integrated with the fixed cover plate. This eliminates the risk of damage from piping loads that can occur when flanged-type nozzles are used.

### Connection Types – Optional



**Flanged**



**Ferrule**

All frames are built from **ASME code materials** and may be certified in accordance with the code as high as 400 psig design pressure and 350° F design temperature.



## Features of the plates

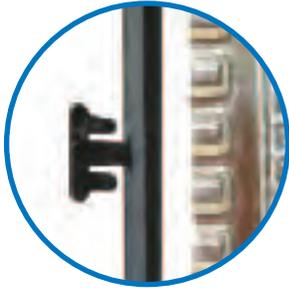
With the UltraHeat plate heat exchanger, Graham offers more plate styles and features than any other supplier and is certain to have a design to meet your specific application requirements. Each plate is stamped with the Graham logo to verify that it is an authentic Graham product that is quality engineered and manufactured for your requirements.

The areas around the ports are **double gasketed** with a vented air space between them. In the event of a gasket failure, fluid leaks to the outside, preventing cross-contamination of fluids.

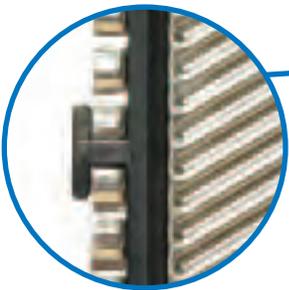
On plate heat exchangers with connection sizes of 4 inches or smaller, the plates are perfectly aligned by a **four-corner interlock system**.



The **glueless "U-clip" gasket design** allows gaskets to be attached to the plates in a sound mechanical way, making them quick and inexpensive to install.



**External tabs** provide an easy visual check to ensure gaskets are in the proper position for sealing.



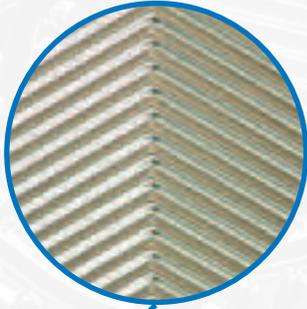
The **distribution area** of the plates is 10 to 20 percent greater than a traditional plate, allowing for even distribution of the fluid across the plate and minimizing pressure loss and erosion concerns.

A **unique plate hanging system** provides exact plate alignment. The hanging portion of each plate has four tabs to prevent left-to-right movement. Another single tab locks the plate to the upper carrying bar to prevent vertical movement.

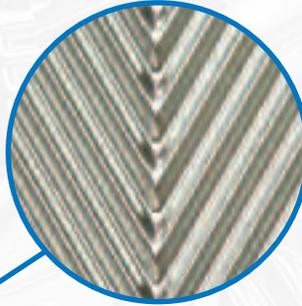


# Superior performance capabilities

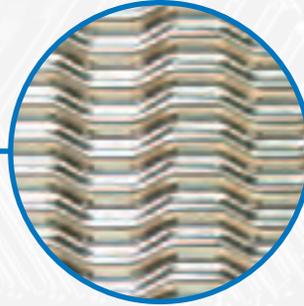
The performance capabilities of the UltraHeat plate heat exchanger are created by the following features:



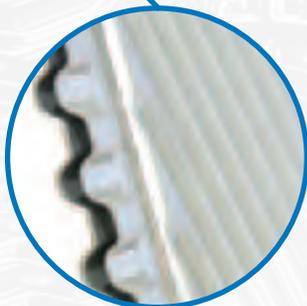
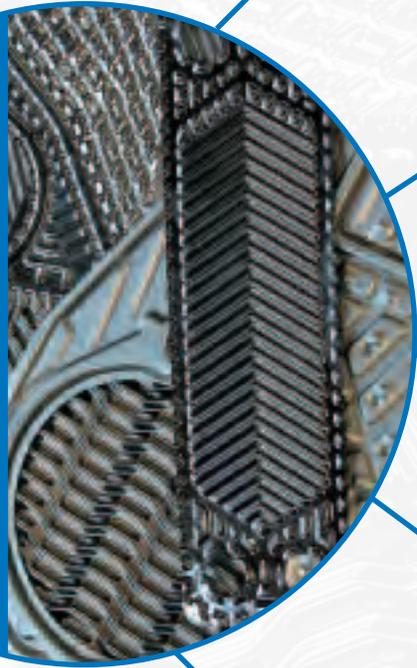
- The **heat transfer plates** are formed with a single pressing motion, which creates superior quality by eliminating the possibility of tool misalignment.



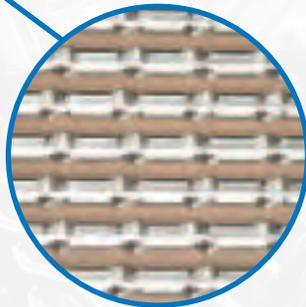
- **High-efficiency plates** have varying depths and corrugation angles to optimize performance for applications involving waters, glycols, oils, process fluids, and high and low viscosity fluids without solids.



- **Wide-gap plates** allow straight flow through channels. This design is ideal for applications involving processes that might contain solids that would plug a more traditional plate heat exchanger.



- **Double-wall plates** have a leak detection path between two plates to isolate products from cross-contamination.



# Graham UltraHeat Specifications

Models	Maximum Flowrate (GPM)	Height (in.)	Width (in.)	Maximum Length (in.)	Conn. Size (in.)	Maximum Surface (sq. ft.)	Pressure Maximum (psi)	Glueless Gasket (Y/N)
<b>Gasketed Plates</b>								
GP34	60	21	75	27	1	30	150	Y
GP151	250	34.5	13.5	66	2	425	300	Y
GP161	250	34.5	13.5	66	2	515	300	Y
GP237	1,000	44	18.5	86	4	605	300	Y
GP258	1,000	44	18.5	86	4	995	300	Y
GP600	1,000	73	23.5	107	4	2,220	300	Y
GP603	4,000	73	29	98	8	1,960	300	N
GP646	2,200	75	24.5	107	6	2,390	300	Y
GP667	2,200	75	24.5	107	6	4,200	400	Y
GP820	4,000	85	29	108	8	3,035	300	N
GP915	4,000	88	30	194	8	4,575	300	Y
GP1614	5,000	109	34.5	162	10	11,300	400	N
GP1980	10,550	111.5	44.5	211	14	12,325	400	N
<b>Double-Wall Gasketed Plates</b>								
GP34D	60	21	75	27	1	28	150	Y
GP151D	250	34.5	13.5	66	2	400	300	Y
GP258D	1,000	44	18.5	86	4	945	300	Y
GP667D	2,200	75	24.5	107	6	3,990	400	Y
<b>Wide-Gap Gasketed Plates</b>								
GP560W	1,000	77	21.5	107	4	2,800	150	Y
GP750W	4,000	73	33	107	8	2,420	150	N
GP1160W	4,000	93	33	107	8	3,710	150	N

**Materials**

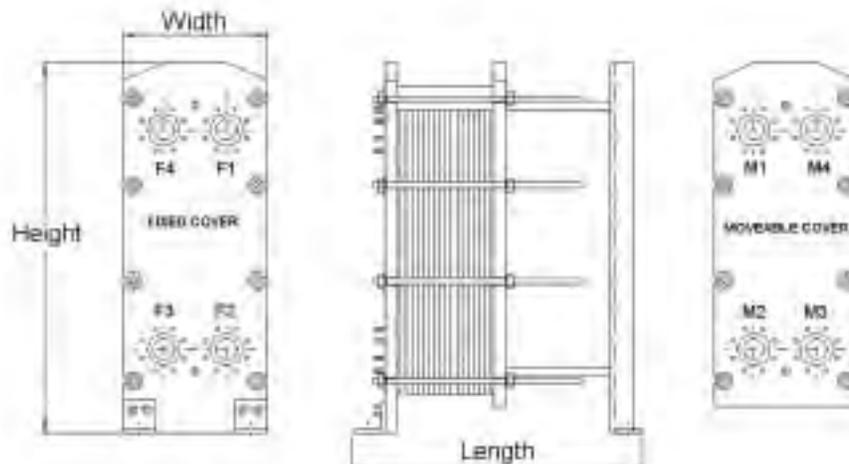
**Plates**

304 and 316 Stainless Steel,  
Titanium, SMO 254, Hastelloy,  
Titanium – Pd, Incolloy, Nickel

**Gaskets**

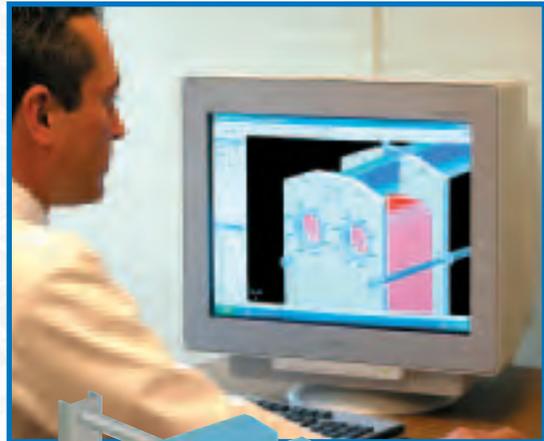
Nitrile, EPDM, Viton,  
Butyl, Klingersil, PTFE

## Overall Dimensions



## The advantages of Graham

- **Quality:** Our equipment is built to meet the world's most exacting standards and codes, such as ASME Section VIII, Div. 1; ISO 9001; American Petroleum Institute; and the Chinese Safety Quality License for Stationary Pressure Vessels.
- **Application expertise:** Graham is a process-oriented company, with 65 years of experience in the chemical, petrochemical and pharmaceutical process industries. Our staff is always available to you for technical assistance, product information or training.
- **Innovation and quality assurance:** Our research and development department is always seeking out new technology to meet your needs. Together with our production test floor, our engineers will work with you on any special project.



Graham Headquarters and Manufacturing Facility.

## Other products from Graham

Graham designs and manufactures two distinct lines of products: vacuum systems and heat transfer equipment. Contact us for more information on any of the following:

- **Brazed plate heat exchangers.**
- **MicroMix® II and MicroMax water heaters.**
- **Clean steam generators.**
- **Ejectors:** Steam jet and organic motivated ejectors, thermocompressors and steam vacuum refrigeration systems.
- **DryFlo™ pumps:** Dry vacuum pump and standard booster systems.
- **Liquid ring pumps:** Vacuum, compressors, packaged vacuum systems and hybrid systems.
- **Process vacuum condensers.**
- **Steam surface condensers:** Turbine-generator condensers and mechanical drive condensers.
- **Heliflow® heat exchangers:** Cryogenic vaporizers and coolers, vent condensers, vaporizers, gas coolers, liquid to liquid, sample coolers and seal coolers.
- **Desuperheaters:** Venturi and steam-atomizing.

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