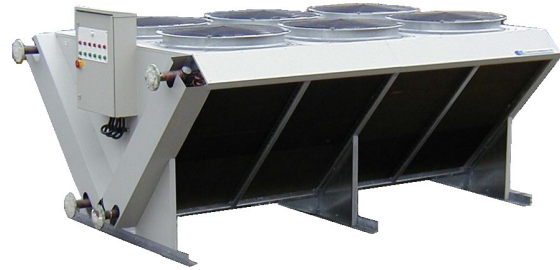


Refrigeration Heat Exchangers



Fully Welded Plate & Shell



Overview

Fluid Dynamics' Plate & Shell Heat Exchangers (PSHE) are the leader in heat exchanger technology.

Compact and manufactured to a high standard of quality, they have at their heart a fully welded pack of circular plates in a strong, unique shell construction.

Fluid Dynamics' PSHE combine the best features of both plate and shell & tube heat exchangers and can withstand high pressures and temperatures.

Compact size

This heat exchanger requires only 25% of the surface compared to shell & tube heat exchangers yet it can be constructed with up to 2000 m² of heat transfer area. The compact size minimizes installation, operating and maintenance costs saving energy and the environment.

Robust and gasket-free construction

The gasket-free construction is durable enough for the harshest conditions, prevents maintenance issues and leakages in very high / low pressures and temperatures.

High thermal efficiency

Its construction creates high turbulence between the plates which provides very high thermal efficiency. This allows full advantage of a compact heat transfer solution in extreme temperatures and pressure, not possible in traditional compact heat exchangers.

Openable version

An openable version offers increased flexibility of use by allowing the fully welded plate pack to be completely withdrawn from the shell for inspection or cleaning.

Applications

PSHE Fully welded and openable version

- Condensers
- Evaporators
- Cascades (evaporator-condenser –model)
- Gas / liquid

PSHE compact

- Liquid / liquid
- Condensers
- End-use areas with minimum space such as portable cooling and steam units
- Replacing plate or shell & tube heat exchangers

Fully Welded Plate & Shell

Main Applications

Evaporators

The versatility of Fluid Dynamics' PSHE is demonstrated particularly in evaporator applications.

PSHE can be used as highly efficient Flooded, or Direct Expansion (DX) evaporators, due to low pressure drop and high heat transfer.

Fully welded circular plates and a protective outer shell, guarantee safety for the end user and ensures high integrity and durability.



Flooded Evaporators

- Refrigerants: NH₃, CO₂, R404, R134a, propane, methane, etc.
- Capacity Range: 5 - 20 000 kW
- Compact Size & Small Refrigerant Charge
- Low Evaporative Side Pressure Drop
- Flexible Construction
- High Efficiency
- Safe Operation

Direct Expansion (DX) Evaporators

- Capacity Range: 5 – 1500 kW
- Can Be Used For All Refrigerants
- Compact Size
- Safe Operation



Cascades

Cascade heat exchangers are used to transfer heat between two refrigerants. They are used especially with CO₂. A cascade unit combines both condenser and evaporator (flooded or DX).

Fluid Dynamics' PSHE are ideal for cascade operations, based on their high thermal efficiency. They can provide minimum temperature difference between the evaporative and condensing media with low running costs.

Using Fluid Dynamics' fully welded construction ensures there is no leakage or cross-contamination.

- Refrigerants: NH₃, CO₂, R404, R134a, propane, methane, etc.
- Capacity Range: 5 – 10 000 kW
- High Heat Transfer
- Low Pressure Drop
- Many Materials Available
- Easy to Install and Insulate



Fully Welded Plate & Shell

Fluid Dynamics' Systems, Flooded Evaporators + Droplet Separators

- Capacity Range: 100 – 5 000 kW
- Compact Size & Small Refrigerant Charge
- Possibility for Internal and External Circulation Systems
- Flexible and Customised Construction
- Safe Operation
- Ready to be Installed



Combined Systems

Combined Systems is a new, extremely compact solution for flooded evaporators and flooded cascades. The evaporator, or cascade, and surge drum are all in one shell. Combined Systems is especially suitable for limited spaces, such as marine applications or production facilities with very limited height. In addition to the compact size, it creates cost savings with insulation, piping and the amount of refrigerant needed.

- Flooded Evaporators + Separator
- Flooded Cascade + Separator
- Multi Pass Droplet Separation
- 50 – 2000 kW
- Small Refrigerant Charge
- Round Plate



Condensers

The construction of Vahterus PSHE is ideal for condensing applications. Key benefits include high thermal efficiency, small/reduced refrigerant charge, and low pressure drop. PSHE are suitable for all refrigerants over a wide temperature and capacity range.

- Refrigerants: NH₃, CO₂, R404, R134a, propane, methane, etc.
- Capacity Range: 5 – 10 000 kW
- Compact Size & Small Refrigerant Charge
- High Heat Transfer
- Low Pressure Drop
- Many Materials Available
- Easy to Install and Insulate



Other Applications

Desuperheaters



Oil Coolers



Ammonia Absorption Plant



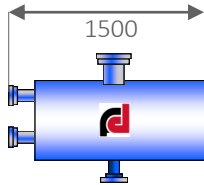
Fully Welded Plate & Shell

Compact & Effective

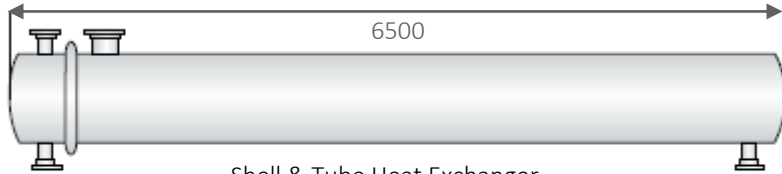
Vahterus PSHE combines the benefits of Plate & Frame and Shell & Tube heat exchangers. PSHE can either be described as a fully welded, high integrity plate heat exchanger, with no gaskets; or a generic alternative to Shell & Tube, approx. 25% of the footprint, displaying both space and weight benefits.

Benefits of PSHE

- No Gaskets or Brazing
- High Integrity / Total Containment
- Strong and Safe Construction
- Unique Protection and Resistance to Thermal and Pressure Cycling
- Thermally Efficient
- Compact and Low Weight
- Flexible Construction
- Proven, Reliable Technology
- Low Fouling
- Minimal Maintenance Requirement
- Close Approach Temperatures



Fully Welded Plate & Shell Heat Exchanger



Shell & Tube Heat Exchanger

Technical Specification

Maximum Heat Transfer Area

- 2000 m²/exchanger

Mechanical Design

- Full vacuum to 200 bar possible
- -200 to +900°C

	Area / Plate m ²	Plate side nozzles DN	Shell side nozzles DN
PSHE 2	0.032	25	20-80
PSHE 3	0.076	50	25-250
PSHE 4	0.15	80	25-300
PSHE 5	0.26	100	25-350
PSHE 7	0.46	150	25-500
PSHE 9	0.80	200	25-700
PSHE 12	1.00	200	25-1000
PSHE 14	1.55	300	25-1000

Quality Systems

ISO 9001:2000

PED Module B+D

ASME U Stamp

OHSAS 18001

ISO 14001

Approvals

PED

ASME U Stamp

SELO, China

AD-2000 HP0

Germanischer Lloyd

R.I.N.A

ABS Europe Ltd.

Bureau Veritas

DNV

Materials

Shell	Plates
St 35.8	AISI 316L
AISI 316L	AISI 904L
AISI 904L	254 SMO
254 SMO	Hastelloy
Hastelloy	Duplex
Duplex	Titanium
Etc	Nickel
	Etc

Semi Welded Plate



Fluid Dynamics' Semi-Welded plate heat exchangers are ideal for solution chilling in refrigeration applications.

The plate packs are manufactured using welded cassettes (two plates welded together). The refrigerant side is contained within the welded portion of the cassette to include welding of the solution port.

Gaskets are used to seal the secondary side which makes the plate pack easy to disassemble and clean.

The welded cassettes are designed for optimum gasket sealing. Higher pressure improves the sealing of the gaskets.

Contact Fluid Dynamics for your next refrigeration application.

Specifications

Frame	Carbon Steel
Nozzles	Rubber Lined Carbon Steel Metal Lined: Stainless Steel 304 or 316 Titanium
Plates	0.6 mm AISI Stainless Steel 304 or 316 Titanium
Design Pressure	11.35 to 25.14 Barg ASME code standard available
Gaskets	Nitrile; EPDM; Viton; Neoprene; Chloroprene
Connections	Studded Port Slip-on or weld neck flange Sanitary ferule Stub end

Brazed Plate



Fluid Dynamics' FD Brazed Plate Heat Exchangers consist of corrugated chevron plates with various brazing materials available for different working conditions.

The high quality of FD Brazed Plate heat exchangers ensures that they are capable of working in high pressure and high temperature environments subject to model selection.

FD Brazed Plate heat exchangers come in a wide range of sizes and brazing materials to ensure the right solution for your needs no matter what the application.

FD-K	Standard	<p>FD-K Series has the largest range of sizes and is widely used in many applications. Versatile and robust they are ideal for use in HVAC, Heat Pumps, Chillers, Oil Coolers, Process Cooling and Heating</p> <p>FD-K: rated to a maximum working pressure of 45 bar</p> <p>FD-K 215: dual circuit with 6 connections.</p>
FD-Z	Large Diagonal Flow	<p>The newly innovative FD-Z Series is designed with a diagonal flow pattern which provides higher efficiency and is a worthy replacement of shell & tube, double tube and multi-tube heat exchangers in various applications.</p> <p>The advantage of the FD-Z Series dual circuit is it provides the best performance in both full load and part load conditions.</p> <p>The FD-Z Series single circuit is specially designed for large volume and high heat transfer efficiency.</p> <p>FD-Z 400/401/Z600 - 4 connections.</p> <p>FD-Z 415 / 416 Dual Circuit - 6 connections.</p>
FD-C	Super High Pressure	<p>The FD-C Series is specially designed for evaporators, condensers, economisers and oil coolers in R744 (CO₂) heat pumps and refrigeration systems.</p> <p>Different designs with maximum working pressure of 70 bar, 100 bar and 140 bar are available for a variety of duties and performance specifications.</p> <p>Compact size, outstanding heat transfer performance and low pressure drop are the three key features.</p> <p>The quality and durability of the FD-C Series is proved by achieving burst test pressures up to 650 bar and testing over 100,000 cycles.</p>
FD-R	High Heat Transfer	<p>FD-R Series represents the upgrade version of the FD-K Standard Series. It is specially designed for R410A systems with heat transfer efficiency of 10% more than the FD-K Standard Series.</p> <p>The FD-R Series is perfectly suited to those applications where pressure drop is not the main concern.</p> <p>Fluid Dynamics' FD-R Series is ideal for Heat Pumps and HVAC applications</p> <p>The FD-KR Series is rated to a maximum working pressure of 45 bar.</p>

Shell & Tube Evaporators & Condensers

Fluid Dynamics Shell & Tube Evaporators & Condensers combine European quality which satisfy the requirements of the European pressure vessel codes and can also be supplied with AS1210 compliance. Manufactured to the highest standards these units come in a variety of materials including copper tubes, brass or carbon steel baffles, asbestos free gaskets and alloy steel bolts with other metals on request.



Shell & Tube Evaporators

	Main applications	Refrigerant	Performance
FD-LSE Dry-expansion Evaporators	Water chilling in air-conditioning plants;	Most common refrigerants	1670kW to 1600 kW up to 4 refrigerant circuits
FD-LPE Dry-expansion Evaporators		R143a	Up to 1150Kw 1 to 4 refrigerant circuits
FD-HPE Dry-expansion Heat Exchangers	Liquid or brine solutions cooling in refrigeration plants;	HCFCs, HFCS etc. compatible with materials	40kW to 750 kW 1 to 2 refrigerant circuits
FD-MPE Dry-expansion Evaporators	Water heating in heat pump systems;	HCFCs, HFCS etc. compatible with materials	15 kW to 1400 kW 1 to 4 refrigerant circuits

Shell & Tube Condensers

FD-CT Condensers	Condensation of refrigerant gas in air- conditioning & refrigeration plants and heat recovery	HCFCs, HFCS, NH3 etc. compatible with materials	10 kW to 2000 kW 1 to 2 refrigerant circuits
FD-M&SM Marine Condensers	Condensation of refrigerant gas in air- conditioning & refrigeration plants using seawater as medium	HCFCs, HFCS etc. compatible with materials	35kW to 750 kW at Eurovent rating conditions
FD-HC Hermetic Condensers	Condensation of refrigerant gas in air- conditioning & refrigeration plants	HCFCs, HFCS etc. compatible with materials	2.6 kW to 50 kW in standard conditions

Fan Forced Evaporators & Condensers



Ceiling Mounted Evaporators - FD-CA & FD-CF

Options include: Cleanable (shown); Defrost; Casing; Fans; Variable fin spacing

Features include:

- Capacities from 5 kW to 250 kW at 10K TD
- Copper tubes for freons;
- Fin spacing: 2 to 6 fpi (8mm to 4mm).



Floor Mounted Evaporators - FD-VA; FD-VF; FD-WA; FD-WF

Options include: Cleanable; Defrost; Casing; Fans; Variable fin spacing

Features include:

- Capacities from 20 kW to 200 kW at 10K TD
- Fin spacing: 4 & 6 fpi (6mm to 4mm);
- Standard fans with 125Pa external pressure



Dual Discharge Evaporators - FD-DAS; FD-DAQ

Options include: Cleanable; Defrost; Casing; Fans; Variable fin spacing

Features include:

- Capacities from 5.6 kW to 142 kW at 10K TD
- Fin spacing: 4 & 6 fpi (6mm to 4mm);
- Standard & quiet fans (low velocity, low noise)



Dry Air Evaporators - FD-FC (Industrial); FD-GD (Compact)

Options include: High Legs; Silencers; Speed Controller; Ecomesh

Features include:

- Capacities from 27 kW to 1118 kW at 15K TD
- Copper or Stainless Steel tubes
- Multiple noise variation (6, 8, 10, 12, 16 pole variations)
- Grey Plastisol coating



Air-Cooled Condensers - FD-DD (Industrial); FD-BSC (Compact)

Options include: High legs; Silencers; Speed controller; Ecomesh

Features include:

- Capacities from 27 kW to 1118 kW at 15K TD
- Fin spacing: 4 & 6 fpi (6mm to 4mm);
- Standard & quiet fans (low velocity, low noise)
- Multiple noise variations (6, 8, 10, 12, 16 pole)
- Plastisol casing
- Flatbed (shown) V-bank or vertical
- Ecomesh adiabatic cooling
- Eurovent certified performance

Fan Forced Evaporators & Condensers

Ammonia Products - FD-CE Evaporators & Special Condensers

Fluid Dynamics recognises the renewed interest in ammonia refrigerant and can now offer a new generation of evaporators and condensers incorporating stainless steel tubes and aluminium fins. These units have been developed after extensive consultation with British Steel Laboratories and incorporate an innovative, new assembly process and welding technique providing highly efficient and reliable products.

Features:

- 16 mm (5/8") Stainless Steel tubes
- Innovative welding technique
- Advantage over galvanised steel coolers:
 - Significant weight savings
 - Better performance
 - Improvements in defrost time
 - Improvements in air temperature recovery



Fluid Dynamics can assist you with all your heat exchanger needs:

- Shell & Tube
 - FluidEX®
 - Marine
 - Fail Safe™
 - Hybrid
 - Custom Build
 - Corrugated
 - Multitube Industrial
 - Multitube Hygienic
 - Annular Space
 - Tube in Tube
 - Exhaust Gas
- Scraped Surface Heat Exchangers
- Special Projects
- FD-Plate™
 - Gasket
 - Gasket - Fail Safe™
 - Brazed
 - Brazed - Fail Safe™
 - Fully Welded
- Fin Tube
- Coil Condensers
- Dry Air Coolers
- Adiabatic Coolers
- Air Cooled Condensers & Evaporators
- FluidAIR® Bar & Plate
- FT Range™ On Road / Off Road
- Ultrasonic Cleaning
- Aftermarket & Re-engineered
- Heat Pumps
- Piston Pumps

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