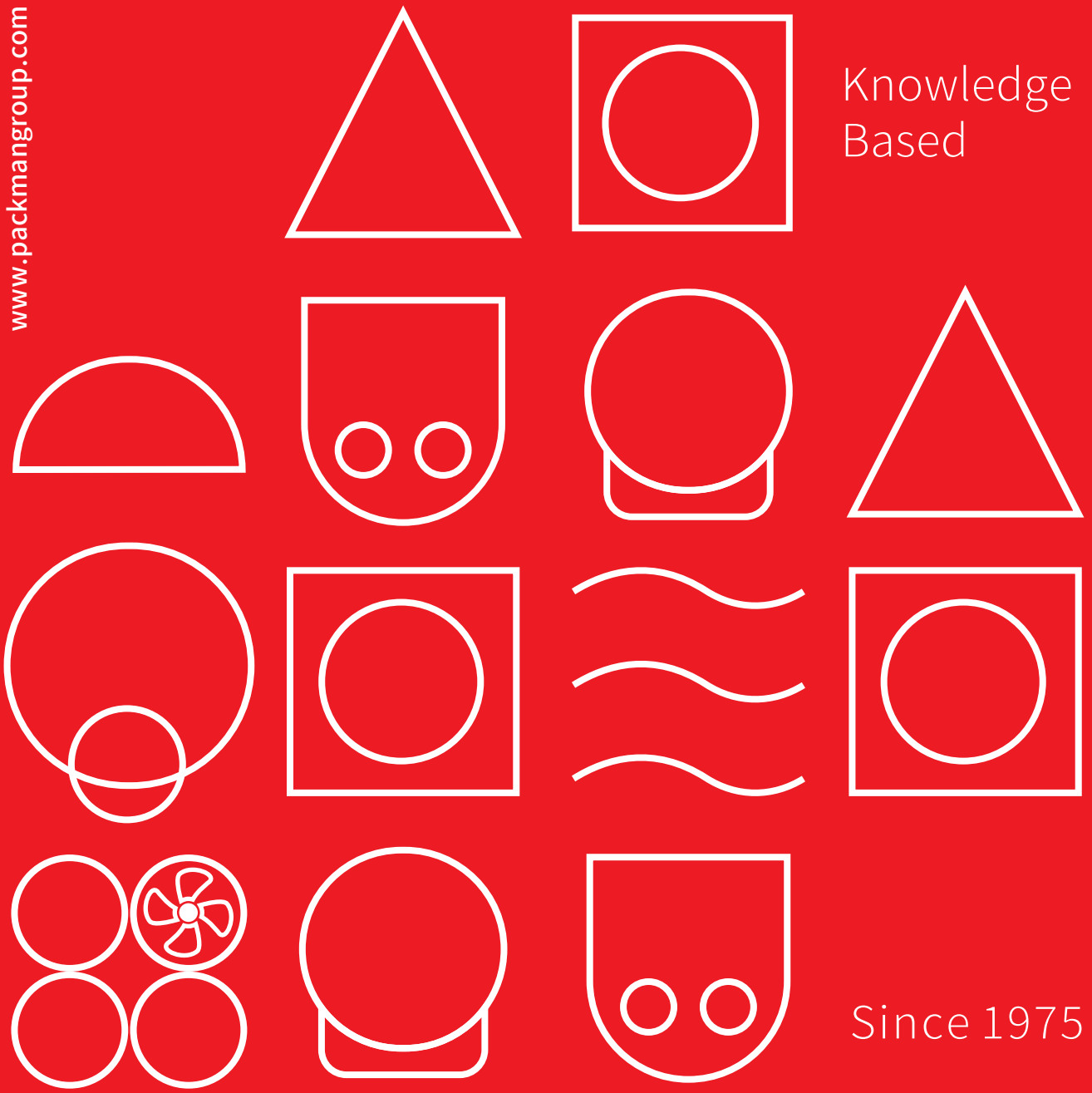


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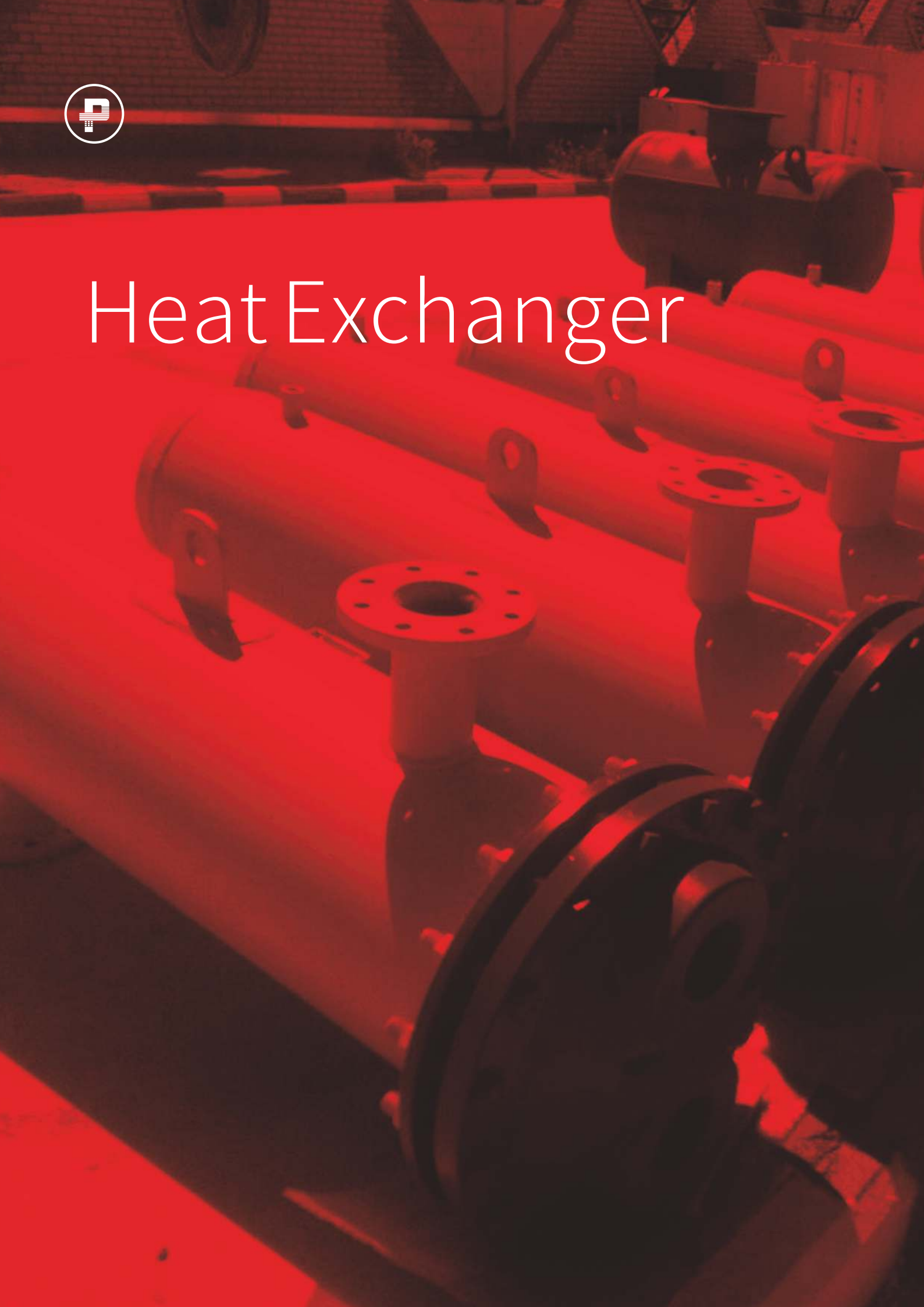
**PACKMAN**  
Industrial Group



Heat Exchanger  
powered by PACKMAN industrial group



# Heat Exchanger





## Product Description

A Shell and Tube Heat Exchanger is the most common type of heat exchangers used in oil refineries and other large chemical processes, and is also suitable for higher-pressure applications. As its name implies, this type of heat exchanger consists of a shell (a large pressure vessel) with a bundle of tubes inside it. One fluid runs through the tubes, and another fluid flows over the tubes (through the shell) the heat is then transferred between the two fluids. The set of tubes which is called a tube bundle, may be composed of several types of tubes: plain, longitudinally finned, etc.

the fluids can be either liquids or gases. In order to heat exchangers which don't experience any phase change between inlet & outlet fluids (liquid or gas) on each side can be called one-phase or single-phase heat exchangers. Twophase heat exchangers can be used to heat a liquid to boil it into a gas (vapor), sometimes called boilers, or cool a vapor to a liquid (called condensers), with the.

### PACKMAN'S Heat Exchanger Properties

Shell and tube Heat Exchangers of PACKMAN Company are U-TYPE and Duplex with Copper Coil. ASME VIII DIV.1 & TEMA CLASS C standards are observed in Heat exchanger's production exchanger's are analyzed, designed and tested via relevant engineering software.

PACKMAN'S heat exchanger's are designed in different diameters from 6 inches to 30 inches, to meet the customer's needs.

The shell made of as advised in the relevant standard. The shell can also be made of stainless steel in case of customer's request. The tubes are the best-quality seamless copper pipes which make the highest heat transfer & efficiencies possible.

The diameter of the tube used in the exchanger is 3/4 inches the thicknesses selected in according with working pressure considering the triangular tube layout.

In this type of exchangers, pipes are connected to the tube-sheet with waltz welding and the tube are easily replaceable.

Packman's exchanger's caps with diameters of up to 14-inch are made of cast iron. Water inlet & outlet Nozzles are in parallel. Higher diameter exchanger's caps are made of steel and water inlet & outlet nozzles are perpendicular with respect to each other.



## Design Of Heat Exchanger

In order to optimize the heat exchanger's design, it is necessary to specify characteristics such as the fluid's flow rate, the inlet and outlet temperature of the fluid's. The heat transfer capacity can replace one of the afore mentioned data in input's list. In order to use a fluid other than water in the heat exchanger's the design of the exchanger changes accordingly.

Thermal design of a shell and tube heat exchanger typically includes the determination of heat transfer area, number of tubes, tube's length and diameter, tube's layout, number of tube passes, type of heat exchanger (fixed tube sheet, removable tube bundle etc.), tube's pitch, number of baffles, their type and size, shell and tube side pressure drop, etc.

Shell is the container for one of the fluids and the tube bundle is placed inside the shell. Shell's diameter should be selected to give a close fit to the tube bundle. The clearance between the tube bundle and inner shell's wall depends on the type of exchanger. Shells are usually fabricated from standard steel sheets with a satisfactory corrosion allowance. The shell's thickness of 3/8 inches for the internal diameters of 12 to 24 inches is reasonable for operating pressures of up to 300 psi.

The most efficient condition for heat transfer is to have the maximum possible number of tubes in the shell to increase turbulence. The tube's thicknesses should be enough to withstand the internal pressure considering the adequate corrosion allowance. The tube thickness is expressed in terms of BWG (Birmingham Wire Gauge) and true outside diameter (OD). The tube's length of 6, 8, 12, 16, 20 and 24 ft are preferably used. Using longer tubes reduces shell diameter at the expense of higher shell's pressure drop. Stainless steel, admiralty brass, copper, bronze and alloys of copper-nickel are the commonly used tube materials.

The number of passes is chosen to get the required tube side fluid velocity to obtain greater heat transfer co-efficients and also reduces scale formation. The tube passes may vary from 1 to 16. The tube passes of 1, 2 and 4 are common in Packman's designs. The partition built into the exchanger's head known as partition plate (also called pass partition) is used to direct the tube's flow.

## Product Capacity Calculation & Selection

Shell and tube heat exchanger's are designed by trial and error. The design



is mainly based on the Kern method. Once the correct type of exchanger has been chosen, the engineering staff of the supplier will need to make sure that the model supplied is correctly sized for the job. The basic heat design equation, which has been widely used for many years, is:

$$Q = U A \Delta T_m$$

Where:

Q is the rate of heat transfer between the two fluids in the heat exchanger

U is the overall heat transfer coefficient. This depends on the conductive properties of the fluids and the material used in heat exchanger

A is the heat transfer surface area

$\Delta T_m$  is the logarithmic temperature difference, calculated from the inlet and outlet temperatures of both fluids. The value of U is harder to calculate:

$$U = \frac{1}{\frac{1}{h_1} + R_{f1} + R_w + \frac{1}{h_2} + R_{f2}}$$

$h_1$  and  $h_2$  are the partial heat transfer coefficients, W/m<sup>2</sup>.K (tube and shell side respectively)

$R_w$  is the thermal resistance of the wall, m<sup>2</sup>.K/W

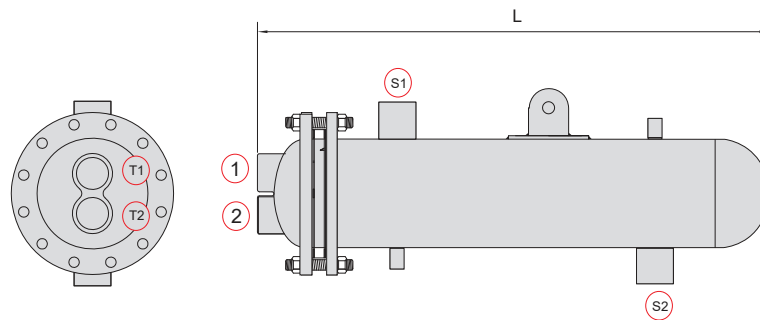
$R_{f1}$  and  $R_{f2}$  are the fouling factors, m<sup>2</sup>.K/W (tube and shell side respectively)

While the values for  $R_f$  are usually specified by the client, the values of  $h$  and  $R_w$  may be influenced directly by the choice of tube size and thickness, and the materials used for construction. The values of the partial heat transfer coefficients  $h$  depend greatly on the nature of the fluids but also, crucially, on the geometry of the heat transfer surfaces with which they are in contact. Importantly, the final values are heavily influenced by what happens at the level of boundary layers: the fluid actually in contact with the heat transfer surface. The driving force for heat transfer is the difference in temperature between the two elements. In the case of a tubular heat exchanger, the temperature of the two fluids changes as they pass through the heat exchanger.



# Heat Exchanger (Water to Water)





Model	Tube Sheet Size	Heating Surface (sq ft)	Water Inlet (S1)	Water Outlet (S2)	Hot Water Inlet (T1)	Hot Water outlet (T2)	Total Length (mm)
<b>Technical Data</b>							
PHXW-65	6"	5'	2"	2"	2"	2"	600
PHXW-67		7.5'	2"	2"	2"	2"	850
PHXW-610		10'	2"	2"	2"	2"	1050
PHXW-612		12.5'	2"	2"	2"	2"	1300
PHXW-615		15'	2"	2"	2"	2"	1500
PHXW-617		17.5'	2"	2"	2"	2"	1700
PHXW-620		20'	2"	2"	2"	2"	1950
PHXW-622		22.5'	2"	2"	2"	2"	2200
PHXW-820	8"	20'	2"	2"	2"	2"	1100
PHXW-825		25'	2"	2"	2"	2"	1300
PHXW-830		30'	2"	2"	2"	2"	1550
PHXW-835		35'	2"	2"	2"	2"	1650
PHXW-840		40'	2"	2"	2"	2"	1850
PHXW-1035	10"	35'	2,1/2"	2,1/2"	3"	3"	1150
PHXW-1040		40'	2,1/2"	2,1/2"	3"	3"	1300
PHXW-1045		45'	2,1/2"	2,1/2"	3"	3"	1500
PHXW-1050		50'	2,1/2"	2,1/2"	3"	3"	1600
PHXW-1055		55'	2,1/2"	2,1/2"	3"	3"	1700
PHXW-1060		60'	2,1/2"	2,1/2"	3"	3"	1850
PHXW-1075		75'	2,1/2"	2,1/2"	3"	3"	2250
PHXW-10116		116'	2,1/2"	2,1/2"	3"	3"	3300
PHXW-1260	12"	60'	3"	3"	3"	3"	1400
PHXW-1270		70'	3"	3"	3"	3"	1600
PHXW-1280		80'	3"	3"	3"	3"	1800
PHXW-1290		90'	3"	3"	3"	3"	1900
PHXW-12100		100'	3"	3"	3"	3"	2100
PHXW-1480	14"	80'	3"	3"	3"	3"	1550
PHXW-1490		90'	3"	3"	3"	3"	1600
PHXW-14100		100'	3"	3"	3"	3"	1750
PHXW-14110		110'	3"	3"	3"	3"	1900
PHXW-14120		120'	3"	3"	3"	3"	2000



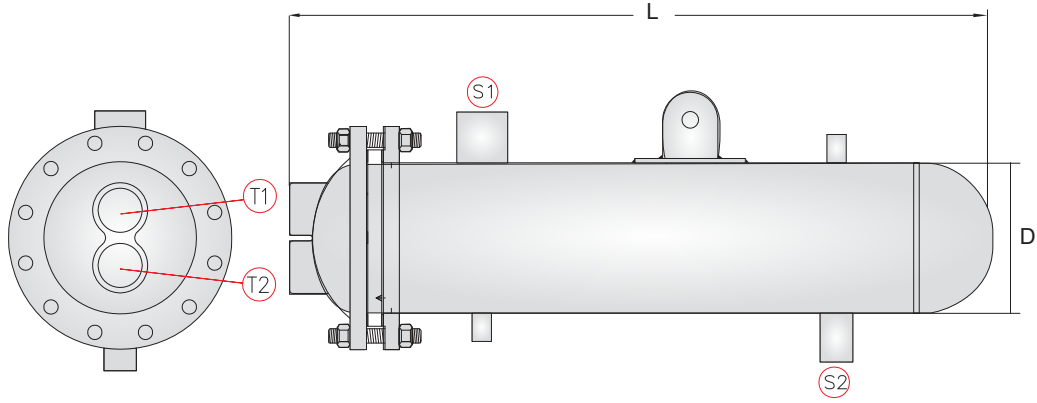
Model	Tube Sheet Size	Heating Surface (sq ft)	Water Inlet (S1)	Water Outlet (S2)	Hot Water Inlet (T1)	Hot Water outlet (T2)	Total Length (mm)
<b>Technical Data</b>							
PHXW-16100	16"	100'	4"	4"	4"	4"	1450
PHXW-16110		110'	4"	4"	4"	4"	1560
PHXW-16120		120'	4"	4"	4"	4"	1700
PHXW-16130		130'	4"	4"	4"	4"	1760
PHXW-16140		140'	4"	4"	4"	4"	1860
PHXW-16150		150'	4"	4"	4"	4"	1960
PHXW-16160		160'	4"	4"	4"	4"	2060
PHXW-18140	18"	140'	4"	4"	4"	4"	2140
PHXW-18150		150'	4"	4"	4"	4"	2200
PHXW-18160		160'	4"	4"	4"	4"	2240
PHXW-18170		170'	4"	4"	4"	4"	2340
PHXW-18180		180'	4"	4"	4"	4"	2440
PHXW-18190		190'	4"	4"	4"	4"	2500
PHXW-18200		200'	4"	4"	4"	4"	2540
PHXW-18210	210'	4"	4"	4"	4"	2640	
PHXW-20200	20"	200'	6"	6"	8"	8"	2330
PHXW-20210		210'	6"	6"	8"	8"	2370
PHXW-20220		220'	6"	6"	8"	8"	2470
PHXW-20230		230'	6"	6"	8"	8"	2500
PHXW-20240		240'	6"	6"	8"	8"	2570
PHXW-20250		250'	6"	6"	8"	8"	2670
PHXW-20260		260'	6"	6"	8"	8"	2720
PHXW-20270		270'	6"	6"	8"	8"	2770
PHXW-20280	280'	6"	6"	8"	8"	2870	
PHXW-24290	24"	290'	8"	8"	10"	10"	2330
PHXW-24300		300'	8"	8"	10"	10"	2330
PHXW-24320		320'	8"	8"	10"	10"	2430
PHXW-24340		340'	8"	8"	10"	10"	2530
PHXW-24360		360'	8"	8"	10"	10"	2580
PHXW-24380		380'	8"	8"	10"	10"	2630
PHXW-24400		400'	8"	8"	10"	10"	2730
PHXW-24420		420'	8"	8"	10"	10"	2830
PHXW-24440		440'	8"	8"	10"	10"	2880
PHXW-24450	450'	8"	8"	10"	10"	3000	



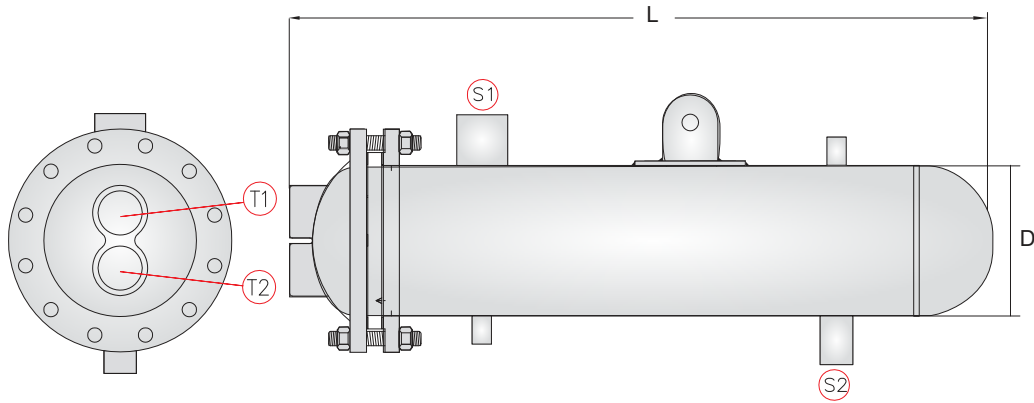


# Heat Exchanger (Steam to Water)





Model	Tube Sheet Size	Heating Surface (sq ft)	Steam Inlet (S1)	Condensate Outlet (S2)	Hot Water Inlet (T1)	Hot Water Outlet (T2)	Total Length (mm)
<b>Technical Data</b>							
PHXS-65	6"	5'	2"	1"	2"	2"	600
PHXS-67		7.5'	2"	1"	2"	2"	850
PHXS-610		10'	2"	1"	2"	2"	1050
PHXS-612		12.5'	2"	1"	2"	2"	1300
PHXS-615		15'	2"	1"	2"	2"	1500
PHXS-617		17.5'	2"	1"	2"	2"	1700
PHXS-620		20'	2"	1"	2"	2"	1950
PHXS-622		22.5'	2"	1"	2"	2"	2200
PHXS-820	8"	20'	2"	1"	2"	2"	1100
PHXS-825		25'	2"	1"	2"	2"	1300
PHXS-830		30'	2"	1"	2"	2"	1550
PHXS-835		35'	2"	1"	2"	2"	1650
PHXS-840		40'	2"	1"	2"	2"	1850
PHXS-1035	10"	35'	2,1/2"	1,1/4"	3"	3"	1150
PHXS-1040		40'	2,1/2"	1,1/4"	3"	3"	1300
PHXS-1045		45'	2,1/2"	1,1/4"	3"	3"	1500
PHXS-1050		50'	2,1/2"	1,1/4"	3"	3"	1600
PHXS-1055		55'	2,1/2"	1,1/4"	3"	3"	1700
PHXS-1075		75'	2,1/2"	1,1/4"	3"	3"	2250
PHXS-1260	12"	60'	3"	1,1/2"	3"	3"	1400
PHXS-1270		70'	3"	1,1/2"	3"	3"	1600
PHXS-1280		80'	3"	1,1/2"	3"	3"	1800
PHXS-1290		90'	3"	1,1/2"	3"	3"	1900
PHXS-12100		100'	3"	1,1/2"	3"	3"	2100
PHXS-1480	14"	80'	3"	1,1/2"	3"	3"	1550
PHXS-1490		90'	3"	1,1/2"	3"	3"	1600
PHXS-14100		100'	3"	1,1/2"	3"	3"	1700
PHXS-14110		110'	3"	1,1/2"	3"	3"	1900
PHXS-14120		120'	3"	1,1/2"	3"	3"	2000
PHXS-14170		170'	3"	1,1/2"	3"	3"	2500



Model	Tube Sheet Size	Heating Surface (sq ft)	Steam Inlet (S1)	Condensate Outlet (S2)	Hot Water Inlet (T1)	Hot Water Outlet (T2)	Total Length (mm)
<b>Technical Data</b>							
PHXS-16100	16"	100'	4"	2"	4"	4"	1450
PHXS-16110		110'	4"	2"	4"	4"	1560
PHXS-16120		120'	4"	2"	4"	4"	1700
PHXS-16130		130'	4"	2"	4"	4"	1760
PHXS-16140		140'	4"	2"	4"	4"	1860
PHXS-16150		150'	4"	2"	4"	4"	1960
PHXS-16160		160'	4"	2"	4"	4"	2060
PHXS-18140	18"	140'	4"	2"	4"	4"	2140
PHXS-18150		150'	4"	2"	4"	4"	2140
PHXS-18160		160'	4"	2"	4"	4"	2240
PHXS-18170		170'	4"	2"	4"	4"	2340
PHXS-18180		180'	4"	2"	4"	4"	2440
PHXS-18190		190'	4"	2"	4"	4"	2500
PHXS-18200		200'	4"	2"	4"	4"	2540
PHXS-18210	210'	4"	2"	4"	4"	2640	
PHXS-20200	20"	200'	6"	3"	8"	8"	2330
PHXS-20210		210'	6"	3"	8"	8"	2370
PHXS-20220		220'	6"	3"	8"	8"	2470
PHXS-20230		230'	6"	3"	8"	8"	2500
PHXS-20240		240'	6"	3"	8"	8"	2570
PHXS-20250		250'	6"	3"	8"	8"	2670
PHXS-20260		260'	6"	3"	8"	8"	2720
PHXS-20270		270'	6"	3"	8"	8"	2770
PHXS-20280	280'	6"	3"	8"	8"	2870	
PHXS-24290	24"	290'	8"	4"	10"	10"	2330
PHXS-24300		300'	8"	4"	10"	10"	2330
PHXS-24320		320'	8"	4"	10"	10"	2430
PHXS-24340		340'	8"	4"	10"	10"	2530
PHXS-24360		360'	8"	4"	10"	10"	2580
PHXS-24380		380'	8"	4"	10"	10"	2630
PHXS-24400		400'	8"	4"	10"	10"	2730
PHXS-24420		420'	8"	4"	10"	10"	2830
PHXS-24440	440'	8"	4"	4"	10"	10"	2880



- Please fill in and attach only one of the following formats to determine the capacity of the diameter and heat surface of heat exchanger. Obviously, calculating will be perfect if we have completed information.

First Format:	
Heat Exchanger Water/Oil to Water/Oil <input type="checkbox"/>	Heat Exchanger Steam to Water/Oil <input type="checkbox"/>
Heating Surface (ft <sup>2</sup> ):	
Shell Diameter (in):	
Determine the Working Pressure (bar):	
Second Format:	
Heat Exchanger Water/Oil to Water/Oil <input type="checkbox"/>	Heat Exchanger Steam to Water/Oil <input type="checkbox"/>
Determine the Working Pressure (bar):	
Hot Fluid Inlet and Outlet Temperature (°C):	
Cold Fluid Inlet and Outlet Temperature (°C):	
Hot Fluid Flow Rate (lit/hr):	
Cold Fluid Flow Rate (lit/hr):	
Third Format:	
Heat Exchanger Water/Oil to Water/Oil <input type="checkbox"/>	Heat Exchanger Steam To Water/Oil <input type="checkbox"/>
Determine the Working Pressure (bar):	
Hot Fluid Inlet and Outlet Temperature (°C):	
Cold Fluid Inlet and Outlet Temperature (°C):	
Thermal Capacity Exchanged Between Two Fluids (btu/hr):	
Forth Format:	
Pool Application:	
Volume of Pool (m <sup>3</sup> ):	
Volume of Jacuzzi (m <sup>3</sup> ):	

# PACKMAN GROUP

## History

The Packman Company was founded in February 1975, and was soon afterwards registered in companies Registration Office. In early years the Packman construction and service branch focused on building installations. Different mega power plants were built by cooperating with Brown Boveri and Asseck companies in 1976.

The company started its official activities in construction of High-Pressure Vessels such as Hot-Water Boilers, Steam Boilers , Storage Tanks, Softeners and Heat Exchangers from 1984.

Packman Company is one of the first companies which supplied the high quality and standard hot water boilers to the customers.

Packman has exported its products to countries such as Uzbekistan, United Arab Emirates and other countries in the Middle East. It is one of the largest producers of hot-water and steam boilers in the Middle East.

Now we are proud to announce that the Packman industrial group has five major sub-brands that have product titles in all field of HVAC equipment and engineering services, and we do not know this success except with the help and support of our customers.

1. Construction Services Industry Association
2. Industry Association
3. Construction Companies' Syndicate
4. Technical Department Association
5. Mechanical Engineering Association
6. Engineering Standard Association

### Departements:

#### Sales Deps:

- ∩ Power Plant & Petrochemical
- ∩ Industrial
- ∩ Hospitally Service
- ∩ Commercial & Residential
- ∩ Sport Complex & Pool

#### Technical Deps:

- ≡ Manufacturing R&D
- ≡ Innovation Center
- ≡ EPC Execute Unit
- ≡ Product Develop Unit
- ≡ Sales Engineering Dep.

#### Others:

- ≈ After Sales Service
- ≈ Project Control
- ≈ Financial Office
- ≈ Commercial Office
- ≈ Marketing Department



# PACKMAN GROUP Brands



**PACKMAN**  
Industrial Group

Designer & manufacturer of Condensing, Hot Water, Steam, Hot Oil & Waste Heat Boilers, Heat Exchangers, Autoclave Pressure & Storage Vessels & etc



**GREENMAN**  
Green mindset, green future

Engineering & Designing Commercial Greenhouse Plant, CO2 Dosing System, Flue gas Condenser & Special HVAC Systems, Sustainable Agriculture & etc



**ROMAN**  
Water solution

Designer & manufacturer Reverse Osmosis Plant & Package, Water Treatment, Softener & Filters and Chemical Dosing Systems & etc



**RAADMAN**  
a look to the future

Designer & manufacturer of Industrial Mono & Dual Block Gas, LPG, Light & Heavy Oil Burners, Premixed & Postmixed Burners, Water tube burners, Process burners, Special application burners & Combustion Solutions & etc



**CHILLMAN**  
Coolest hvac around

Designer & manufacturer of Air & Water Cooled Chillers, Air Handling Units, Fancoil, HVAC Equipment, Cold Storage Room & etc



1. Isfahan Factory



2. Vilashahr Factory



3. Parand Factory



4. Parand (2) Factory



5. Bonyad Factory

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