



# Alfa Laval Packinox

## Packinox+

### Introduction

Alfa Laval Packinox+ is a compact solution for maximum heat transfer in positions with high flow rates, temperatures, and pressures.

Asymmetric flow channels make Packinox+ ideal for all duties with two-phase flows, e.g. gas-to-liquid. The unique plate design of Packinox+, combined with a counter-current flow, results in high heat-transfer efficiency and low pressure drop.

### Applications

- Carbon capture
- Renewable power
- Petrochemicals
- Gas processing
- Energy storage
- Thermal power
- Crude oil refining

Packinox's design is tried-and-tested, with more than 500 units in operation in plants across the world. Superior performance, high reliability, and short payback time have made Packinox the industry standard for energy-intensive applications, such as catalytic reforming and aromatics production.

### Benefits

Like all Alfa Laval Packinox heat exchangers, a Packinox+ offers many benefits over a shell-and-tube solution:

#### Maximized energy efficiency

- Ideal for asymmetric flows, thanks to FlexFlow technology
- Fully customized design for optimal performance
- Outstanding heat recovery – minimal HAT (hot approach temperature) and thermal efficiency >95%
- Low pressure drop
- Guaranteed performance

#### Improved profitability

- Low CAPEX and short payback time: compact size and high capacity make it possible to replace multiple shell-and-tube or plate heat exchangers with a single unit
- Low OPEX: robust design and reliable operation, periodic long-term performance reviews from Alfa Laval
- High return-on-investment



#### Reduced CO<sub>2</sub> emission

- Compact size, for optimized use of raw materials
- Reduced fossil fuel consumption thanks to outstanding heat recovery

#### How it works

Packinox+ is available in two different design configurations: plate-and-shell and plate-and-frame.

Both configurations are packed with state-of-the-art heat transfer technology, perfect for demanding process applications.

Thanks to its robust, compact design, Packinox+ can cater to applications of all sizes, without compromising productivity.

# Packinox+ plate-and-shell

The core of an Alfa Laval Packinox+ plate-and-shell heat exchanger is a fully welded bundle of heat transfer plates. The counter-current flow of the hot and cold media, in combination with the high turbulence, maximizes heat transfer between the streams.

The plate bundle resides inside a pressure vessel filled with cold-stream gas under high pressure. This means the plate bundle is only exposed to the differential pressure between the hot and cold streams, minimizing the mechanical stress on the plate welds.

## Maximum performance with asymmetric flows

The flow geometries of the different fluid streams in an Alfa Laval Packinox+ heat exchanger can be individually optimized to ensure both superior heat transfer and an optimized pressure drop when handling highly asymmetric flows.

FlexFlow is also useful when a very low pressure drop is required for one or more of the fluid streams.

## Packinox Performa

Packinox Performa gives you a detailed view of the operation and condition of your Packinox heat exchanger by providing a real-time view of the operation, and weekly reports with condition analyses and performance forecasts. This makes it easy to optimize maintenance, ensure reliable uptime, and maximize energy efficiency.

## Design configuration

### Customized design

Each Packinox+ heat exchanger is designed and built to the exact conditions under which it will operate. Performance is optimized by selecting the correct plate pattern, gap distance, plate dimensions, number of plates,  $\Delta T$ , and pressure drop. The result is outstanding performance and cost effectiveness.

### Low pressure drop with HyperCut

A low operating pressure is key for high yields in many processes. Packinox+ heat exchangers combine excellent heat recovery with low pressure drop, usually within the range 0.3 to 1.5 bar (total flange-to-flange, both sides).

Thanks to Alfa Laval's unique HyperCut plates, the pressure drop over the distribution area of the plates is very low. This means more of the available pressure drop can be utilized in the heat transfer area of the plate, resulting in higher heat transfer.



For more information about our service offering, visit our website: >>

## Robust design

Alfa Laval Packinox+ plate-and-shell heat exchangers are designed and built for maximum operating reliability. The chevron pattern on the heat transfer plates is produced using underwater explosion forming, a technique developed by Alfa Laval to maximize the mechanical strength of the plates. Laser welding ensures high weld quality and strength.

We operate under a rigorous quality management system, and thorough inspections are performed at each step of the production process.

## Accessible for service

The plate pack is accessible for service through a manhole at the top of the unit and through one of the bellows from the bottom. All welds can be repaired, channels can be plugged, and bundles can be replaced, if necessary.

## Installation

Alfa Laval Packinox+ heat exchangers are installed in an upright position (the pressure vessel is fitted with a skirt or brackets) with a minimal footprint.

## Dimension

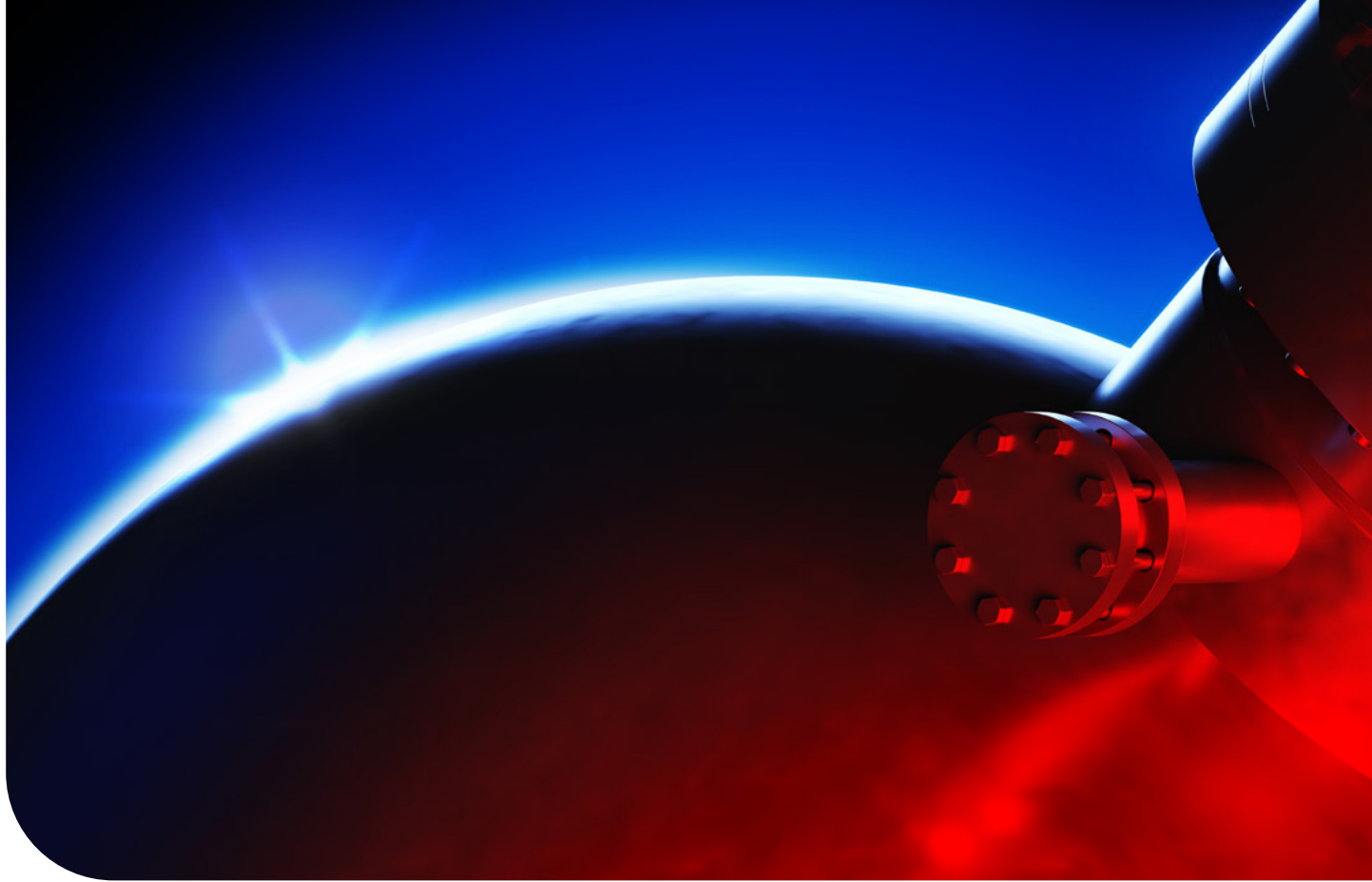
### Current size range

- Shell diameter: 1.5 m to 6 m (3 to 18 ft.)
- Shell total length: 10 m to 20 m (30 to 65 ft.)
- Total weight: 30 to 400 metric tons (60,000 lb. to 600,000 lb.) Equivalent S&T surface area: 1,000 to 35,000 m<sup>2</sup> (10,000 to 375,000 sq. ft.) in a single shell.



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## Technical data

### Construction materials:

#### Bundle

Stainless steel (SS 321, SS 316, SS 304, etc.).  
Qualified construction materials include: all types of austenitic stainless steel, including highly corrosion resistant Alloy 6 Mo

#### Vessel

Qualified construction materials include: 1.25 Cr 0.5 Mo, 2.25 Cr 1.0 Mo, stainless steel, carbon steel or other qualities, as per customer requirements.

#### Bellows

Inconel, Incoloy or other, subject to demand.

## Pressure and temperature operating limits

### Temperature

The typical design temperature is up to 550°C (1,000°F).  
Design temperatures as high as 650°C (1,200°F) have been achieved. Note: internal bellows compensate for thermal differential expansion.

### Pressure

Our reference list includes exchangers with design pressures ranging from 3 bar to 140 bar.

Differential pressure between feed and effluent is the bundle's only mechanical limitation. As a conservative measure, we currently limit this value to 55 bar (depending on the configuration and operating temperature).

### Codes and Standards

Alfa Laval Packinox's quality and environmental management systems are certified according to ISO 9001 and ISO 14001. We comply with all international standards for pressure vessel manufacturing, for example ASME U, U2, R, NB, as well as all local standards and regulations (PED 2014/68/EU, ATEX, EN 13445, CODAP, AD 2000-MERKBLATT, High Pressure Gas Control Law, TR CU 010/2011 and TR CU 032/2013, Korea Gas Safety, etc.)



# Packinox+ plate-and-frame

The core of an Alfa Laval Packinox+ plate-and-frame heat exchanger is a fully-welded bundle of heat transfer plates. The hot and cold streams flow in alternate channels in the plate bundle, in opposite directions. The counter-current flow maximizes heat transfer and makes it possible to operate with crossing temperatures in a single unit.

The corrugation of the plates causes high turbulence in the media, increasing heat transfer and minimizing fouling.

## Maximum performance with asymmetric flows

The flow geometries of the different fluid streams in an Alfa Laval Packinox+ heat exchanger can be individually optimized to ensure both superior heat transfer and an optimized pressure drop when handling highly asymmetric flows. FlexFlow also creates new opportunities when a very low-pressure drop is required for one or more of the fluid streams.

The overlapping welds on two of the sides of the plate bundle form solid walls. The other two walls are reinforced with side panels, held together by a large number of tie rods. This design allows an Alfa Laval Packinox+ plate-and-frame heat exchanger to be operated at pressures up to 70 bar.

A Packinox+ plate-and-frame heat exchanger can be configured to operate with more than two flows, meaning several media can be heated or cooled simultaneously. Each flow can have an individual number of channels and the channel gap can be adjusted for different media.

## Design configuration

### Customized design

Each Packinox+ heat exchanger is designed and built to the exact conditions under which it will operate. Performance is optimized by selecting the correct plate pattern, gap distance, plate dimensions, number of plates,  $\Delta T$ , and pressure drop. The result is outstanding performance and cost effectiveness.

### Low pressure drop with HyperCut

Packinox+ plate-and-frame heat exchangers combine excellent heat recovery with low pressure drop, usually within the range of 0.3 to 1.5 bar (total flange-to-flange, both sides).

Thanks to Alfa Laval's unique HyperCut plates, the pressure drop over the distribution area of the plates is very low. This means more of the available pressure drop can be utilized in the heat transfer area of the plate with higher heat transfer as a result.

### Robust design

Alfa Laval Packinox+ plate-and-frame heat exchangers are designed and built for maximum operating reliability.

The chevron pattern on the heat transfer plates is produced using underwater explosion forming, a technique developed by Alfa Laval, to maximize the mechanical strength of the plates.

We operate under a rigorous quality management system, and thorough inspections are performed at each step of the production process.

## Accessible for service

All welds in the plate pack are accessible for service and can be repaired.

## Installation

Alfa Laval Packinox+ plate-and-frame heat exchangers are installed in an upright position within minimal footprint.

## Dimension

### Current size range

- Height: 10 m to 20 m (30 to 65 ft.)
- Weight: 30 to 400 metric tons (60,000 lb. to 600,000 lb.)
- Equivalent S&T surface area: 1,000 to 35,000 m<sup>2</sup> (10,000 to 375,000 sq. ft.) in a single unit.

## Technical data

### Plate materials

Stainless steel (SS 321, SS 316, SS 304, etc.).  
Thickness 0.8 to 1.5 mm.

## Pressure and temperature operating limits

### Temperature

Up to 400°C (752°F).

### Pressure

Total and differential pressure up to 70 bar.

## Codes and Standards

Our quality and environmental management systems are certified according to ISO 9001 and ISO 14001.



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# Key features



## HyperCut

**Unique plate design that increases reliability and reduces pressure drop**

The design of our patented HyperCut plates increases the mechanical robustness and operating reliability of your Packinox+ heat exchanger, reduces the pressure drop over the distribution areas, and improves operability. This makes it possible to maximize heat recovery, minimize size and CAPEX, and reduce the overall pressure drop.



## ALOnline

**Digital services for maximum uptime and performance**

We offer a range of digital services for our Packinox+ heat exchangers, including process optimization, condition monitoring and predictive maintenance through our Packinox Performa software, as well as remote guidance and support from our experts via video link.



## Explosion Forming

**High-strength plates with long, reliable lifetime**

The pattern on a Packinox+ heat transfer plate is formed by the shockwave from an underwater explosion. This one-step operation minimizes residual stresses in the plates, making them mechanically stronger. The end result is very high operating reliability and longevity.



## ALOnsite

**Qualified support at your facility**

With Alfa Laval as your partner, you have the full backing of our global service network, including 24/7 remote technical support. We can be at your plant within 1-2 days if you need onsite assistance.



## Spray Bar

**Optimized mixing**

Internal mixing of the liquid feed and recycle gas is unique for Packinox heat exchangers. Our patented Spray Bar technology ensures perfect mixing, resulting in better heat transfer, less mechanical stress and more reliable operation compared to mixing in the inlet pipe.

NB: Only for Packinox+ plate-and-shell design



For more information about Packinox+ plate-and-frame key features, visit our website: >>

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