

5.4 Scraped-Surface Heat Exchangers

Contherm scraped surface heat exchangers are the ultimate heat transfer solution for heat sensitive, sticky, abrasive, particulate laden, crystallizing/phase changing or other difficult to treat products in food, dairy, cosmetic, chemical, and other industries



PD Sheets

Contherm® Core Scraped-Surface Heat Exchanger	.5.4.1244
Contherm® Scraped-Surface Heat Exchanger (SSHE)	.5.4.1246
Convap® Scraped-Surface Evaporator	.5.4.1248

For low to medium viscosity products

Contherm® Core Scraped-Surface Heat Exchanger

Applications

Scraped-surface heat exchangers (SSHE) are at the heart of both continuous and semi-continuous viscous food and personal care processes. The Contherm® Core SSHE provides exceptional thermal efficiency, which is a prerequisite for viscous processing. Contherm Core ensures higher throughput, uniform heat transfer and more economical operation, compared to other heat exchangers.

Contherm Core is designed specifically to process low to medium viscosity products, such as soups, sauces, ketchup, fruit purees, dressings, baby food and desserts as well as skin lotions, facial cream and shampoo.

Contherm Core features and benefits

- The 6x11 model offers 0.15 m² (1.62 ft².) larger surface area than other scraped-surface heat exchangers in the market
- Features the same proven critical core components of the Contherm including the heat transfer cylinder, seals and blades
- The Contherm Core can handle up to 50,000 cps and 25 mm (1 inch) particles
- Optional flushed seals allow for aseptic processing

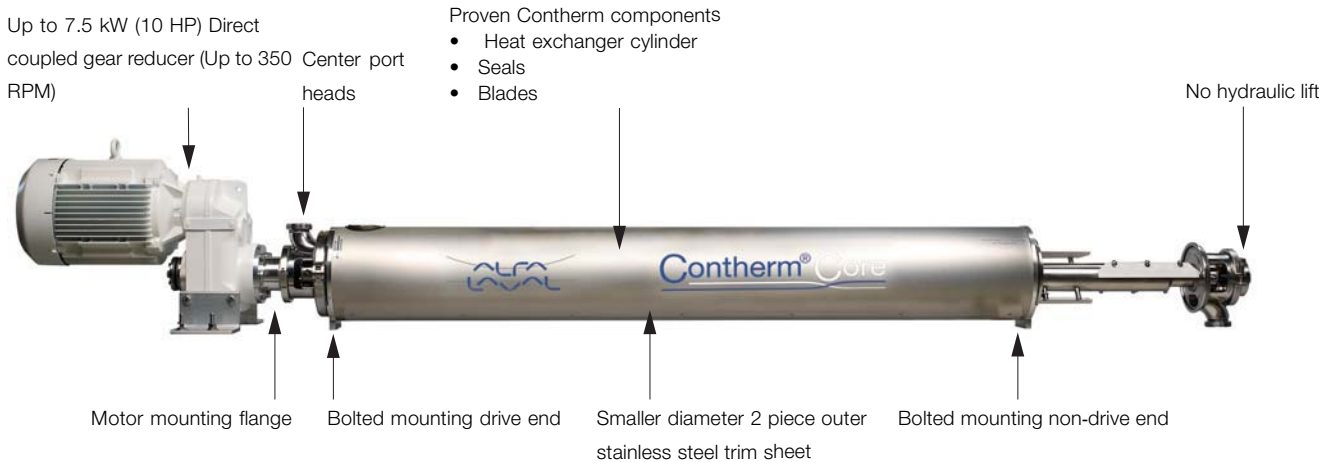
Design

When processing less complicated low to medium viscosity products, sometimes a more simple scraped-surface heat exchanger solution is needed. Based on the traditional Contherm and exact "core" components, Contherm Core was developed to provide a cost-effective, simple design with the quality and reliability expected from Alfa Laval.

This design ensures easy installation and reliable operation adding up to an increased product lifetime and return on investment.

Contherm Core is only available in a horizontal installation frame and with an option to stack three Contherm Core units on top of each other. The frame set-up requires only a minimum of interconnecting pipework and is made of bead-blasted 304 stainless steel.





Three Contherm Core units on frame

Specifications

- Models 6x9 (0.85 m² (9 ft²)) and 6x11 (1 m² (11 ft²))
- 316/316L stainless steel cylinder
- FDA approved AlfaLaval® III scraping blades
- 76 mm (3 inch) or 114 mm (4.5 inch) staggered rotors
- Single or double mechanical carbon seals
- 51 mm (2 inches) SMS, DIN or Tri-Clamp connections
- Center port product heads for bidirectional product flow
- Up to 7.5 kW (10 HP) motor and directly coupled gear reducer
- Simplified mounting frame (optional)

Working principle

Product is pumped into the Contherm heat exchange cylinder. As it flows through the cylinder, it is continuously mixed and removed from the cylinder's precisely finished wall by the scraping blades. This scraping action results in thin film product heating or cooling, a surface free from fouling deposits, and a corresponding high heat transfer rate. The drive can be adjusted for varied rotor speeds – an important feature when a number of different products are to be processed. Heating or cooling media flows in the annular space between the Contherm's heat exchange cylinder and the insulated jacket.

When liquid media is used, a spiral coil is installed in the annulus to provide higher heat transfer efficiency. When utilizing steam or flooded expansion refrigerants such as liquid ammonia or Freon, the coil within the Contherm Core annulus is removed. The use of these refrigerants requires other ancillary equipment such as refrigeration accumulators and control valves, products that Alfa Laval can provide.

On start-up, air is completely purged from the Contherm. At the end of a processing run, the product can be drained or pushed by water, resulting in minimal product loss.

The Contherm's maximum flow rate is application specific and determined by the temperature program, nature of the product and type of duty.

Heat Transfer Solution for Low to High Fouling Products

Contherm® Scraped-Surface Heat Exchanger (SSHE)

Applications

The Contherm® scraped-surface heat exchanger (SSHE) has found use within many different processes and applications for manufacturing food, chemicals, pharmaceuticals, cosmetics, health and beauty products, etc. It is particularly suited for processing viscous, heat sensitive, sticky or chunky (containing particulates) products that are to be pumped.

It can be used in a broad range of processing environments, including: aseptic, heating, slush-freezing, sterilization, cooling, pasteurization, crystallization and phase change.

Design

The standard design of Contherm includes:

- Standard execution is vertically mounted on a column. The column needs to be secured to either a wall or the ceiling.
- Rotor is driven by electrical motor installed on upper end of the unit.
- Rotor is placed on ball bearings. Mechanical seals at each end of Contherm prevent product leakage and external contamination.
- Rotating scraping blades are secured to pins welded to the rotor.
- A hydraulic lifting device provides an easy way to lower the rotor and blades for maintenance and inspection.
- Tangential inlet/outlet ports provide gentler handling of the product, resulting in better product integrity and quality, by allowing product to enter and exit cylinder in same direction as the turning rotor.
- It is designed to comply with the most stringent industry standards. USDA and 3A hygienic design certifications are available for special executions.
- Contherm is manufactured according to ASME and PED. Other pressure vessel codes are available on request.

The Contherm SSHE can operate with a large flexible range of media types, such as: steam, thermal oil, water, glycol, brine, Freon™ or ammonia and other liquified gas refrigerants.

Working principle

Product enters the cylinder through the lower product head and flows upwards through the cylinder. At the same time, the heating/cooling media travels in counter-current flow through the narrow annular channel between the heat transfer wall and the insulated jacket.

Rotating blades continuously remove product from the cylinder wall in order to ensure uniform transfer of heat between media and product. An optional coil in the annulus increases media velocity, adding to the heat transfer efficiency.

Product exits the cylinder through the upper tangential port. On start-up, air is completely purged from the Contherm. At the end of a processing run, the product can be drained or "chased-out" by water resulting in minimal product loss.

Scraper configuration, rotor diameter and rotor speed can be varied to suit the properties of the particular product flowing through the cylinder.

Numerous Contherm configurations are available. Trained, knowledgeable Alfa Laval staff are able to customize each Contherm unit by selecting the appropriate materials, features and options to meet each customer's exact requirements.



Flow Rate

The Contherm's maximum flow rate is application specific and determined by the temperature program, nature of the product, and type of duty.

Technical Information

Working temperature range:

Product side: -35°C to +170°C

Media side: -35°C to +170°C

Maximum working pressure:

Product side: 20 bar and full vacuum

Media side: 17 bar

Connections - product side:

51 mm DIN, Tri-clamp, SMS, other

76 mm DIN, Tri-clamp, SMS, other

Connections - media side:

51 mm Upper - NPT or flange

37 mm Upper - Lower NPT or flange

Materials

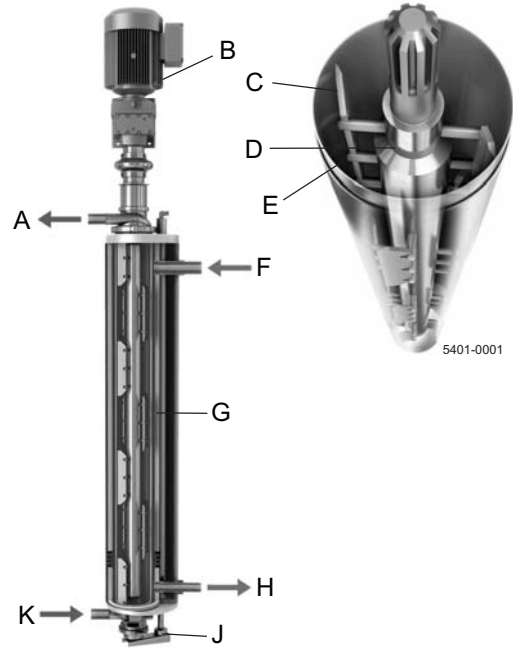
The heating surface is made in 316 L stainless steel, honed to a very high finish on the inner surface. The scraping blades are made of Alfalon® III, Nylon and Teflon material.

The seals are made of single carbon mechanical, carbon flushed / aseptic, hard face and hard face flushed / aseptic. Suitable materials will be selected for special applications.

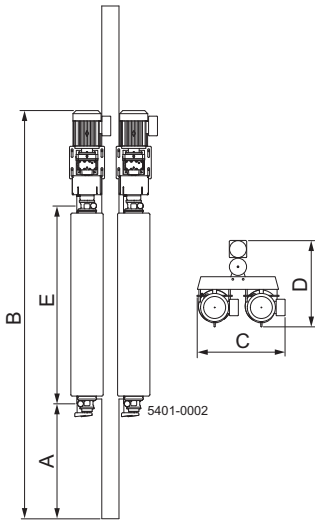
Optional Features

The following optional design features are available:

- Alternative mounting configurations, including a horizontal option for use in facilities with limited ceiling height
- Control panel with automatic maintenance status feature to prevent product freezing if flow is interrupted
- Refrigeration (accumulator) or heating/cooling valve packages.
- Rotors in different sizes: 76 mm diameter, 102 mm diameter, 114 mm diameter, 127 mm diameter
- 27 barg product-side pressure rating is available



- A = Product outlet
- B = Motor
- C = Blade
- D = Heat transfer surface
- E = Rotor
- F = Heating/cooling media port (in) (Refrigerant - out)
- G = Insulation
- H = Heating/cooling media port (out) (Refrigerant in)
- J = Rotor lifting device
- K = Product inlet



Model	Heating surface [m ²]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	Net* weight [kg]	Floor space [m ²]
6 x 3	0.279	854	2,502	864	933	717	140	0.33
6 x 6	0.557	1,387	3,645	864	933	1,326	234	0.33
6 x 9	0.836	1,997	4,864	864	933	1,936	274	0.33
6 x 11	1.020	2,355	5,689	864	933	2,205	306	0.33

* The height may vary depending on the size of the motor

Removing moisture from viscous products

Convap® Scraped-Surface Evaporator

Application

Convap® is a specially modified Contherm® unit designed as a continuous scraped-surface evaporator. This makes it particularly suited for concentrating viscous, sticky and/or heat sensitive products that tend to cause fouling in static types of heat exchanger.

Convap can effectively concentrate products to extremely high solids levels, in some cases up to 99%. And it is often used to process products that rapidly become viscous as they undergo concentration. Convap can function as a preevaporator to any dryer type, as it makes the overall process from concentration to drying of a product more efficient.

Typical Convap applications include the production of purées, mashes, pulps, concentrate and pastes from fruits and vegetables. Convap units are also suitable for processing a wide selection of confectionery, protein solutions such as whey protein, lecithin, sugar solutions, chemical and pharmaceutical solutions, and for concentrating plant waste materials into heavy slurry for easy disposal. Convap units can also be used for concentrating coffee and other extracts.

Design

The standard Convap scraped-surface evaporator is based on a modular design and is normally mounted vertically on a wall or column. The modular design permits the deployment of one to four Convap units configured in parallel or up to two units in series to meet specific capacity requirements. Convap heat exchanger cylinders can also be configured so that several units use a shared separator vessel and condenser. Each Convap is assembled from standard, pre-fabricated components.

The major components of a standard Convap unit are:

- Scraped-surface heat exchange cylinder
- Vapour dome
- Separator vessel
- A 4-bladed rotor configuration to prevent product burn-on

Specifications

Working temperature

Product side: . . . -35°C to +170°C

Media side: . . . -35°C to +170°C

Maximum working pressure

Product side: . . . 20 bar and full vacuum

Connections

Product side: 51 mm/2 inch DIN, Tri-clamp, SMS, other 76 mm/3 inch DIN, Tri-clamp, SMS, other

Media side: 51 mm/2 inch Upper - NPT or flange 37 mm/1½ inch Upper - NPT or flange



Materials

The cylinder heating surface can be made of 316 L stainless steel, 316 L HIPEX stainless steel, corrosion-resistant alloy or nickel, with unique coatings such as chrome, triple-chrome and Alfoloy.

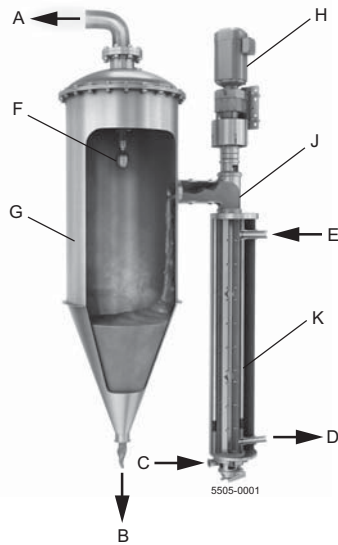
The scraping blades are available in configurations that include Alfolon®III, Alfolon® III-S (metal detectable), PEEK, stainless steel and corrosion-resistant alloy. All blades can be fitted as slotted or spring loaded.

The seals are available in configurations that include single carbon mechanical, carbon flushed / aseptic, hard face and hard face flushed / aseptic, Huhnseal, and high torque / flushed, depending on application.

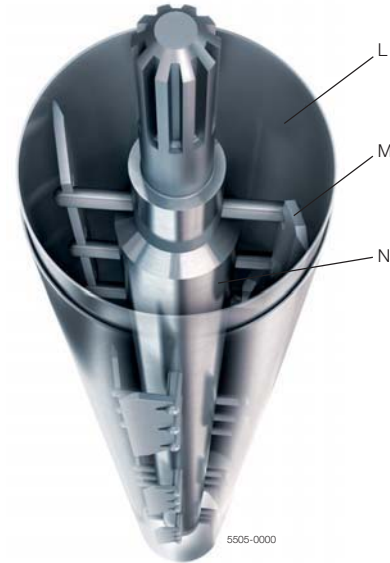
Optional features

The following optional design features are available for Convap units:

- Control panel with automatic maintenance status features for expansion refrigerant applications
- Rotors in different sizes: 76 mm diameter, 102 mm diameter, 114 mm diameter and available in unique designs such as high-torque spline and heavy-duty blade pins
- Motors in a range of different power configurations and in explosion-proof design
- Condenser
- Spray ball mounted in separator vessel, CIP pump and pressure sensor for concentrate flow



- A = Vapour outlet
- B = Concentrated product out
- C = Product inlet
- D = Heating media port (out)
- E = Heating media port (in)
- F = Spray ball system for CIP
- G = Separator vessel



- H = Motor
- J = Vapour dome
- K = Insulation
- L = Heat transfer surface
- M = Blade
- N = Rotor

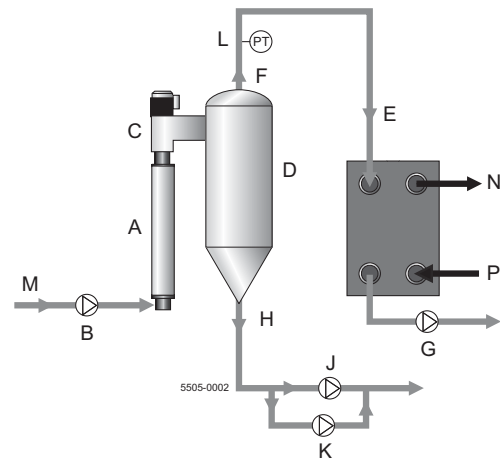
How it works

Just as in Contherm units, the product is pumped (B) into the lower end of the Convap heat exchanger cylinder (A). The heating medium flows in the annular space between the heat transfer wall and the insulated jacket. Mechanical agitation, provided by the revolving blades, creates the convection conditions essential for efficient heat transfer. The scraping blades continuously remove the product film from the precision- /finished cylinder wall.

The Convap rotor, driven by a motor on the upper end of the unit, spins the heavier liquid droplets towards the cylinder wall. This action ensures a continuous re-wetting of the heat transfer surface and the removal of vapour, as well as preventing product burn-on.

The Convap is normally operated under vacuum. Vaporization occurs in the Convap scraped-surface heat exchanger cylinder (A). The separator (D), connected to the Convap by a custom-designed vapour dome (C), allows the separation of the concentrate from the vapour phase. In the separation vessel, the vapour exits the top to a condenser (E) driven by a vacuum pump (G), while the concentrated product exits at the bottom, forced by a concentrate removal pump (J).

As an option, separator vessel can be fitted with a spray ball head for effective CIP cleaning in between batches. A pressure sensor (L) can be fitted on the top of the separator vessel and a level transmitter can be fitted on the concentrated product out piping. A loop for a CIP bypass pump (K) can also be implemented.



- A = Heat exchanger cylinder
- B = Feed pump
- C = Vapour dome
- D = Separator vessel
- E = Condenser
- F = Vapour outlet
- G = Vacuum pump
- H = Concentrated product out
- J = Concentrate removal pump
- K = CIP bypass pump
- L = Pressure sensor
- M = Product
- N = Water out
- P = Water in

Convap Model	Heating surface [m ²]
6x3	0.28
6x6	0.56
6x9	0.84

This page is intentionally left blank

5.5 Modules

Process modules composed out of our flow, tank and heat exchange components can be configured to meet the specific customer demands for numerous different applications in food and other industries.



PD Sheets	
SteriTherm™ VLA5.5.1252
SteriOhm5.5.1255
Alrox5.5.1257
SteriTank5.5.1259

Aseptic heat treatment module for food applications

SteriTherm™ VLA

5.5

SteriTherm™ VLA is an extremely versatile and robust module designed for aseptic heat treatment of a wide range of food products.

Heart of this module is the Viscoline™ annular heat exchanger that is ideal for use with highly viscous food products, providing exceptionally efficient heat transfer as well as considerable versatility in terms of both products and capacity. The design ensures gentle treatment with uniform heating/cooling and long runtimes, and is extremely reliable in operation. This results in very low service and maintenance requirements.

Application

SteriTherm VLA units are in widespread use in heat treatment sterilization i.e. pasteurisation of single and double-strength fruit purées of apple, berries, mango, guava, etc., fruit juice concentrates, jams and marmalades, baby food, banana, soups and sauces and a range of different tomato products.

This equipment has the additional advantage of being able to efficiently treat products with a content of fibres and particles of up to 16 mm in length or diameter. In addition, special SteriTherm VLA versions are available with gaps of up to 32 mm so that they can be used to treat products such as fruit salads, pizza sauce, pineapple tidbits, etc.

A SteriTherm VLA module is normally installed as part of an aseptic processing line. Such a line usually includes an aseptic bag filler and – in some cases – an aseptic tank.

Design

The SteriTherm VLA is an aseptic heat treatment system intended for combining with aseptic fillers and/or aseptic tanks. The modular unit is pre-assembled on skids for easy, rapid delivery and installation.

To help ensure the required hygiene levels, the sterile product loop is equipped with valves incorporating steam barriers, and the operating mode makes sure the pressure in the sterile product loop is always higher than in the ambient air.

Precise control of operating parameters provides reliable, consistent product treatment. Heat treatment temperatures normally range between 95°C and 110°C although temperatures up to 140°C or more are possible, depending on the particular application. The system can be CIP cleaned using detergents dosed into the inlet feed (optional equipment) or from a central CIP station.

The SteriTherm VLA module features the Viscoline VLA -4 annular tube heat exchangers. In this type of heat exchanger, the product flows through the annular space between two concentric pipes, surrounded by heating or cooling media on each side. The media flows counter-currently to the product through similar annular gaps between the outer product pipe and the shell pipe, as well as between the inner product pipe and the pipe in the centre. A wide range of configurations (with gaps of between 4–23 mm) is available for the distance between the different pipes – the annular gap.

The media and/or product pipes can also be corrugated, depending on which products they are to be used with and the capacity required. This makes heat transfer even more efficient as well as reducing the laminar flow effect of viscous products.



Standard scope of supply basic model

- Feed balance tank
- Product pump of positive type
- Centrifugal pump for CIP/SIP
- Viscoline VLA heater using circulating hot water
- Hot water set including steam and condensate groups
- Holding cell
- Viscoline VLA cooler (tower water)
- Viscoline VLA cooler (chilled water)
- Diversion valves with steam barrier
- Viscoline VLA return SIP cooler
- Control cabinet with PLC and MCC for automatic operation
- All surfaces in contact with product are made of AISI 304 stainless steel or equivalent (AISI 316 in heat exchangers)

Optional features and equipment

- Detergent (caustic/acid) dosing modules
- Conductivity measurement
- Feed flow control
- PED approval
- FDA-compliant design
- Product-wetted surfaces made of materials other than AISI 316/304, stainless steel, such as SMO

Working principle - SteriTherm VLA basic design

Superheated water at 125 °C is used to pre-sterilize (SIP) the SteriTherm VLA unit for 30 minutes before any product is admitted.

The product enters via the balance tank and is then pumped through the first heater, where circulating hot water heats it to the appropriate sterilization temperature. The subsequent tubular holding cell provides the product residence time necessary for effective treatment.

The product is then cooled in two stages, – by tower water and then subsequently by chilled water – before being led to the filler/aseptic tank. A diversion function is included to ensure that no un-treated product reaches the filler, should the heat treatment temperature drop below a pre-set value. For high acid products (pH<4.5) this is arranged in such a way that the production can restart as soon as the right temperature has been regained, without the need of a re-sterilization with water.

SteriTherm VLA with integrated Alox deaerator

The SteriTherm VLA can be integrated with a special Alox deaerator module to remove air from the product prior to heat treatment. The SteriTherm and Alox units, along with their control systems, are completely integrated.



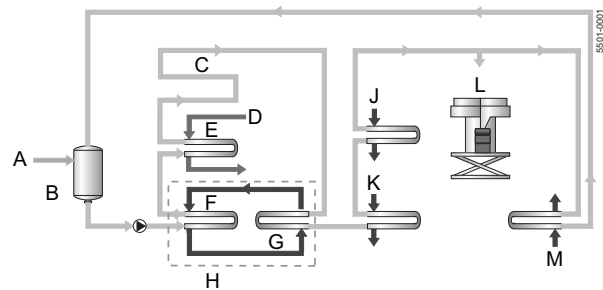
SteriTherm VLA-R (heat recovery)

A special version of the SteriTherm VLA is available with indirect heat recovery, for improved energy efficiency. In this configuration, circulating water is transferring heat – extracted from the hot product that has passed through the holding cell – to the flow of cold product entering the system at the beginning of the process.

Such heat recovery is particularly advantageous at feed temperatures below 40°C , making it possible to reduce consumption of steam and cooling water by as much as 40–50%.

SteriTherm VLA-H (high pressure)

Some products with very high viscosities, such as fruit purée concentrates, can require a special version of the SteriTherm VLA capable of operating with high pressures. This unit is fitted with a high-pressure piston pump and heat exchangers and valves with higher pressure ratings. This version can also be adapted to tackle the particular requirements associated with banana puree processing. Other configurations can be made available by special request.



Principal flow diagram basic model

- | | |
|---------------------------|-------------------------------------|
| A = Product | G = Recovery cooling |
| B = Balance tank | H = Model SteriTherm VLA-R only |
| C = Holding | J = 2 nd cooling with chilled water |
| D = Hot water circulation | K = Cooling with water |
| E = Heating | L = Aseptic filling bag-in-drum |
| F = Recovery heating | M = SIP cooling with water |

5.5

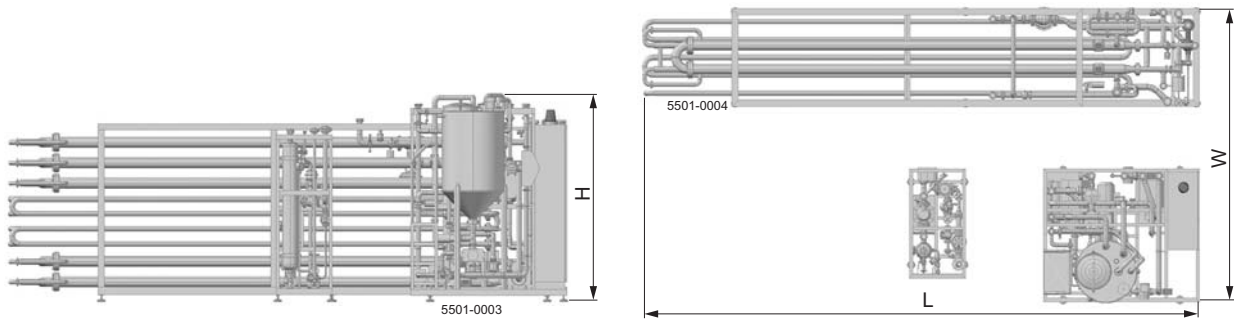
Technical specifications

Basic model		Size 1	Size 2	Size 3	Size 4	Size 5
Capacity	kg/h	2,500	3,500	6,000	8,000	10,000
Steam	kg/h	270	370	650	850	1,100
Tower water	m ³ /h	3.3	16	30	24	55
Chilled water	m ³ /h	3.3	8	15	8	18
Installed power	kW	6.6	8.5	14	17.2	19
Dimension L	mm	7,500	7,500	7,500	7,500	7,500
Dimension W	mm	4,000	4,000	4,000	4,500	4,800
Dimension H	mm	3,000	3,000	3,500	3,500	3,500

*Capacity based on single strength fruit puree of approx 1000 cP viscosity and a feed temperature of 50°C

Note: dimensions are indicative

Example of general layout basic model



Ohmic heating units for the food, dairy and beverage industries

SterilOhm

5.5

Application

The SterilOhm heating units from Alfa Laval Astepro are based on a unique technology that uses an electric current to ensure rapid uniform heating of pumpable food and beverages. Ohmic heating technology is especially useful in conjunction with the pasteurization or sterilization of products containing large particles in cases where it is essential that the final product retains its nutritious values, vitamin content and taste.

SterilOhm heating units are used in processing of a wide variety of fruits and vegetables, prepared foods, cheese, liquid eggs, ready-to-eat dishes, sauces, juices, etc.

Design

The SterilOhm unit has a power capacity of 60 kW (80 HP) and can be combined in series with up to 5 units for heating inputs in greater volumes. Each SterilOhm unit consists of a transformer, annular electrodes and software that automatically adjusts voltages to match different product conductivities. The pipework consists of lengths of insulated Pyrex or Teflon pipe with a uniform diameter of 1-4 inches (25.4-101.6 mm) which ensures an unobstructed product throughflow. Depending on product viscosity and the size of any particles present in the product being heated, SterilOhm units are available for mounting either horizontally or vertically. In order to secure the requested heat treatment, the outlet temperature is self-regulated once set. SterilOhm units can be delivered as complete integrated system in a processing line with pumps, aseptic cooling sections, automation control systems, aseptic tanks, etc. to comply with individual customer specifications.

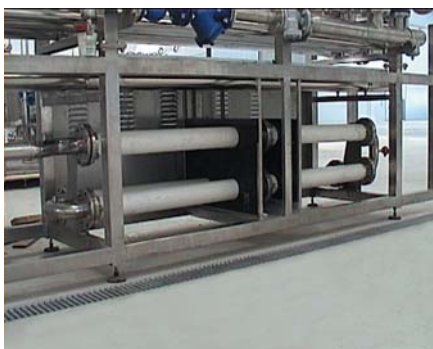
Working principle

The pumpable food product is led into the insulated pipe where it is heated up to the required temperature via two electrodes (+ and -) that transfer the electrical current to the product. Due to the electrical resistance of the product and the resultant Joule effect, the electricity heats up all the product being held inside the pipe, at the same time. This means the heating effect is uniformly distributed throughout all the material within the length of pipe, regardless of the specifications and characteristics of the product.



The benefits of SterilOhm heating units include:

- Heating the entire volume of the product at the same time ensures that the carrier liquid and any particles are heated at the same rate, thus preventing any over- or undercooking
- The rapid heating and low pressure ensures the integrity of any particles within the product
- The gentleness of the heating process that makes sure the end-product retains its nutritious values, vitamins, colour and taste
- Accurate, rapid-reacting temperature control
- No need for long lengths of piping and high-pressure pumps reducing the cost and complexity of heating installations
- Easy cleaning in between start-ups



120 kW SterilOhm unit in horizontal configuration for use with products containing particulates.



30 kW SterilOhm pilot unit in vertical configuration for use with viscous products. As an option vertical units can also be supplied with a Sweb surface system (patent pending) for products where fouling can be a problem.

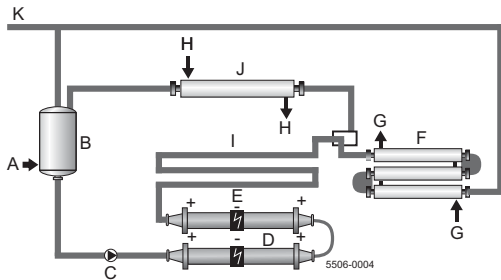
Specifications

SterilOhm	Ohmic pilot	SterilOhm 1	SterilOhm 2	SterilOhm 3	SterilOhm 4	SterilOhm 5
Power capacity	30 kW (40 HP)	60 kW (80 HP)	120 kW (160 HP)	180 kW (240 HP)	240 kW (320 HP)	300 kW (400 HP)
Power supply	400V 50Hz	400V 50Hz	400V 50Hz	400V 50Hz	400V 50Hz	400V 50Hz
Output	20 KHz	20 KHz	20 KHz	20 KHz	20 KHz	20 KHz

5.5

Note: The flow rate depends on Delta T. Alfa Laval Astepo can provide specific estimates/capacity modules on request based on each client's data for product details, needed capacities required, etc.

Schematic flow diagram for an Ohmic heating installation



- | | |
|----------------|-----------------|
| A Product in | F Cooling |
| B Balance tank | G Cooling media |
| C Pump | H Cooling media |
| D Ohmic heater | I Holding |
| E Heating | J SIP Cooler |

Deaerator module for food applications

Alrox

5.5

Application

Alrox is a special process module designed for removing free, dispersed and/or dissolved air from a wide range of food products – including juices, purées, nectars and baby food – using vacuum deaeration.

Design

The Alrox process module is intended for integration with AlfaTherm and SteriTherm™ heat treatment modules. The unit is pre-assembled on a skid for easy, rapid delivery and installation. The special design of the Alrox, with different options available to suit different applications, provides efficient deaeration of almost everything from single-strength juice to very viscous food products.

Effective deaeration results in less oxidation of the product. This ensures better retention of important nutrients, such as vitamin C, as well as making sure the product has better flavour and colour stability. Other important benefits include less fouling in subsequent heat treatment operations, resulting in increased uptime. Removing air also improves the performance of subsequent homogenization processes.

Working principle

The Alrox basic model works on the basis of hot deaeration. Adding an optional Alfa Laval spinner distribution system makes it possible to work at lower temperatures, using cold deaeration.

Hot deaeration

The incoming product, which is normally at a temperature around 40–60°C, is fed into a vacuum vessel via a distributing nozzle. The vacuum present inside this vessel corresponds to a boiling temperature that is 2–5°C lower than the product inlet temperature.

The product expands into the vacuum. The release of pressure, and the resultant boiling, causes instant evaporation of some of the water in the product. This has the effect of stripping out any air that may be present, in whatever form.

The vacuum in the separator is maintained by a liquid ring vacuum pump. The deaerated product is discharged through the bottom outlet to an extraction pump that pumps the product out to the next processing step.

Cold deaeration

In the Alfa Laval spinner distribution system, which is optional equipment for the Alrox deaerator module, a special disc rotates at high speed, spreading the product in thin layers as it enters the vacuum vessel. This means the entrapped air is mechanically exposed to the vacuum with maximum efficiency. This system provides efficient deaeration for very viscous products (up to 10000 cP), making it particularly suitable in processing fruit purées and concentrates. The spinner distribution system makes it possible to also remove the air from product flows at lower inlet temperatures of 10–40°C. This is usually called “cold deaeration”, and is very advantageous with products that are particularly sensitive to heat.



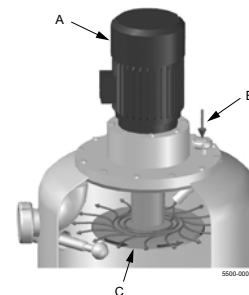
Condenser

A special condenser can be added to the Alrox deaerator module in order to minimize aroma losses. The stripped air and vapour are conveyed to the condenser, where the vapour that includes the aroma constituents is condensed. This aroma condensate is then returned to the deaerated product, while the non-condensable gases are vented out through the vacuum pump.

In cases where a relatively large amount of vapour is stripped from the product, the condenser is necessary in order to maintain the required vacuum.

Built-in CIP

The Alrox module is designed from the outset for effective Cleaning in Place (CIP) procedures, and the separator is equipped with CIP spray balls.



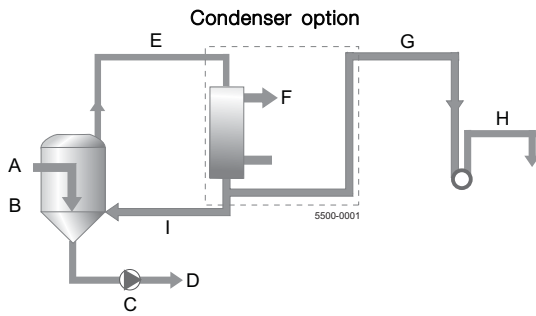
Spinner distributor working principle

A = Drive motor

B = Product inlet

C = Rotating disc

Principal flow diagram basic model



- A = Product
- B = Vacuum vessel
- C = Extraction pump
- D = Deaerated product
- E = Stripped air/vapour
- F = Cooling water
- G = Air
- H = Vacuum Pump
- I = Condensed water/aroma return

Specifications

The standard Alrox module features:

- Vacuum vessel in which deaeration takes place
- Level control system
- Vacuum pump for extracting non-condensable air or gas
- Vacuum control system
- Frame for mounting the equipment
- All surfaces in contact with product made of AISI 304 stainless steel, or equivalent

The module is pre-assembled on a skid for easy, rapid delivery and installation

Optional equipment

The following optional equipment is available:

- Spinner distribution system for use with highly viscous products
- Condenser
- Inspection cover
- Control panel
- Product extraction pump (centrifugal type)
- Product extraction pump (positive type) and CIP pump (centrifugal type)
- Product wetted surfaces made of other materials than AISI 304

Other configurations are also available, on special request.

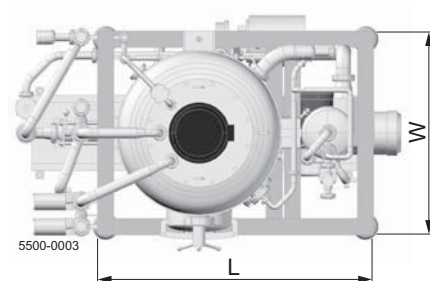
Technical specifications

Basic model		3-DR 450	6-DR 650	12-DR 800	18-DR 1000	24-DR 1300	48-DR 1600
Nominal capacity (*)	[Lit./h]	3,000	6,000	12,000	18,000	24,000	48,000
Installed power (**)	[kW]	1.5	3.0	3.0	4.0	4.0	5.5
L	[mm]	1,500	1,700	1,800	2,200	2,500	2,700
W	[mm]	800	950	1,200	1,300	1,600	1,900
H	[mm]	2,700	3,200	3,600	4,000	4,700	5,000

(*) Capacity based on a feeding temperature of 50-60°C and viscosity < 200cP, for higher viscosities capacity is lower.

(**) Product extraction pump not included.

Dimensions are indicative.



Aseptic tanks for the food and beverage industries

SteriTank

5.5

Application

This range of aseptic tanks is designed and manufactured to store liquids and viscous products, including dairy products, prior to aseptic filling. Alfa Laval Parma can deliver aseptic tanks covering volume capacities from 50 litres up to 20.000 litres.

Design

SteriTank aseptic tanks consist of stainless steel vessels with product inlet at the top or the bottom, depending on the products involved. They are designed to meet the most stringent hygienic requirements for the food and beverage industries and are fully compatible with cleaning-in-place (CIP) procedures.

The tanks have semi-spherical upper parts and a semi-spherical or conical bottom, and are designed and tested to perform at a maximum pressure of 4 bar and under absolute vacuum. This means they can work safely even under difficult processing conditions. SteriTank aseptic tanks are available with different diameters and heights in order to fit into the space available, and can be customized to meet customers' specific needs. SteriTank units can also be fitted with different mixing equipment best suited to the particular food and beverage applications. A horizontal design is also available, and this is ideal for products that contain particulates, such as in the production of prepared foods.

All surfaces that come into contact with the products are mirror polished while external surfaces are satin-finished. The tanks are self-supporting mounted on a robust skid or on feet. SteriTanks up to 3000 litres in capacity are delivered as a complete integrated tank unit with all components and electrical panel mounted on a skid.

Working principles

Prior to production start the aseptic tank is sterilized with steam and then cooled. Tanks with capacities of under 3000 litres are cooled by injecting sterile air or nitrogen, which is also suitable for preventing air suction, due to the vacuum effect.

SteriTanks with capacities of over 3000 litres are refrigerated by circulating chilled water through the tank's coil. During the cooling operation, the tank is kept under a slight pressure. The air is kept sterile by a set of filters, and the pressure is monitored and controlled automatically.

A set of sterile pneumatic valves for product inlet and product outlet are included in the SteriTank system. These valves are protected by a steam barrier at a controlled temperature/pressure to prevent cross-contamination.

The units are managed by a PLC with a live digital feed that displays the different operating steps (CIP, SIP, Production) in different colors. It also shows the position of the valves and the critical factors such as temperatures, etc. and shows the volume of product inside the tank. As an optional feature, the processing data can be captured and stored via software and the mimic panel can be supplied with a color digital feed



Technical specifications

The standard range of vertical SteriTank units includes the following capacities: 50 (pilot plant only), 200, 500, 1000, 2000 and 3000 liters. The SteriTank range can also be delivered as mixed horizontal tanks, with capacities of: 500 or 1000 liters.

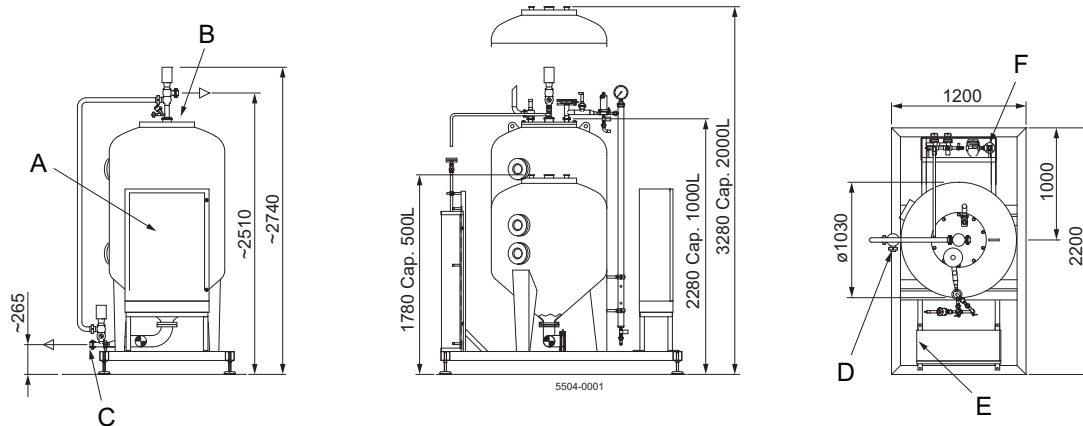
- Tank made of AISI 316 or AISI 304 stainless steel
- Pressure check up to 4 bar under PED regulations
- Stainless steel feet and stainless steel AISI 304 stainless steel frame to support all equipment in SteriTanks with capacities of up to 3000 litres
- Pressure vessels comply with PED (ASME optional)
- Flange for cooling water inlet/outlet and modulating valve
- Flanges for product inlet and outlet
- Flange for sterile air inlet
- IP 55 electric panel made of AISI 304 stainless steel, including PLC and instruments for managing and controlling all operational steps (production, stand-by, CIP and SIP). The signals with sterilization and CIP plants are also included. The solenoid valves for the pneumatic valves and the power controls for the motors are also cabled in

Standard components

- Piping and assemblies for product and services connections
- DIN connections
- Steam control loop
- Level control system by electronic differential pressure
- Product discharge valve
- CIP pneumatic valve inlet and return
- CIP spray ball and CIP input valve
- Safety valve
- Aseptic valves for product inlet/return
- Air on-off valve inlet or modulating (optional)
- Parts in contact with product made of AISI 316 stainless steel
- Sterile filter for over-pressurized gas probe level
- De-oiling filter and absolute sterile filters (two in series for low-acid applications)
- Manhole on the top for inspection
- Pressure switch
- Inspection glass

Optional components

- Steam valve for in situ sterilization of the tank and product piping outlet.
- Mixer with a slow anchor stirrer for viscous products or a magnetic helix stirrer for liquid products containing pulps to avoid sedimentation and floating.
- Rockwool insulation for safety protection and AISI 304 foil cover.
- AISI 304 coil for water circulation is included for SteriTanks with capacities of over 3000 litres.
- Load cells
- Pressure vessels that comply with PED for the CE market or as ASME for the US market
- Aseptic valves outlet for more than one filler in connections
- Aseptic discharge lobe pump with steam barriers and inverter for remote flow control.



Example of dimensional specifications [mm]

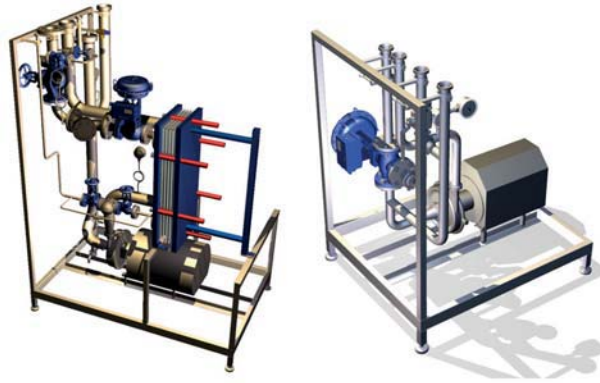
A = Electro pneumatic board
B = Product/CIP return DIN DN40

C = Product to filler DIN DN40
D = Product/CIP inlet DIN DN40

E = Air/nitrogen inlet
F = Steam inlet DIN DN15

5.6 Utility Modules

Our pre-assembled and pre-configured utility modules are the reliable source for hot/cold water or glycol supply to the customer's plant



PD Sheets

Cold Water Module5.6.1262
Hot Water Module5.6.1264

Glycol and water based system

Cold Water Module

5.6

Application

The Alfa Laval cold water module is designed to supply cold water/glycol as a cooling medium for all types of Alfa Laval heat exchangers. It is designed for when high flow rates are required for the cooling medium, and in particular to operate with cold water/glycol with a temperature below the crystallization or freezing point of the product passing through the heat exchanger. This means the cold water/glycol cannot be sent directly to the heat exchanger, because it might cause the product to crystallize or freeze.

To achieve the required water/glycol temperature, a supply of fresh cold water/glycol is constantly fed into the circulation loop from the plant's cooling system. A circulation pump makes sure the full flow of cold water/glycol gets to where it is needed in the heat exchanger. This specialized module can also easily be combined with many other types of equipment, such as stand-alone heat exchangers, or installed as part of a SteriTherm™ aseptic heat treatment system. It is ideal for use in conjunction with food processing installations in which cold water/glycol is used as the cooling medium.

Design

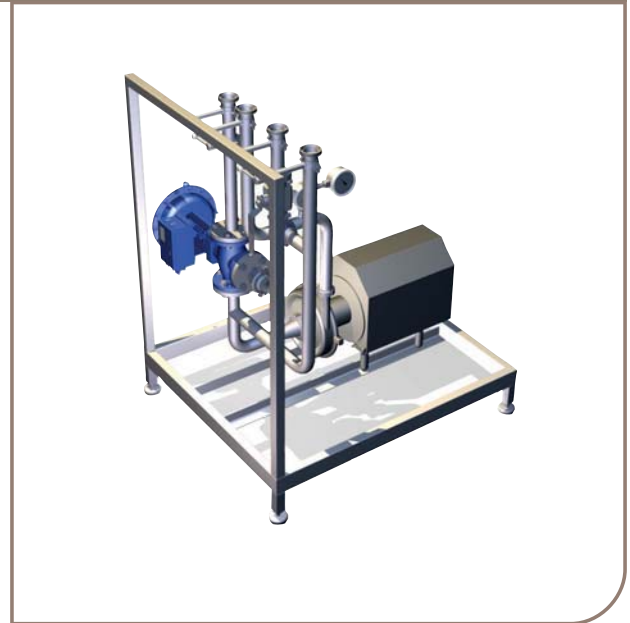
The Alfa Laval cold water module is a pre-assembled skid-mounted unit designed and built specifically to ensure a steady supply of cold water/glycol with only minimal variations in temperature. This supply is automatically regulated by the combination of the cold water/glycol regulating valve and the controller unit built into the control panel.

This cold water module includes a water circulating pump powered by an electric motor, a 3-way valve for regulating the flow of cold water/glycol, the appropriate instruments and internal piping, all installed on a stainless steel frame.

The cold water module is delivered skid-mounted as a complete pre-assembled unit that is easy to install close to the heat exchanger using the cold water/glycol, or in a suitable separate utility room.

This pre-configured set-up makes it easier, quicker and cost-efficient for the customer to ensure a reliable, consistent supply of cold water/glycol with pre-determined specifications. It reduces the risk, cost and delays often associated with ad hoc installations using individual items of equipment from different manufacturers. It makes the operation of heat exchangers more efficient and more consistent, thus helping boost quality results and reduce overall operating costs.

Alfa Laval cold water modules can be customized to suit a wide range of specific operating needs as well as individual customer requirements.



Features

- Compact, modular design
- Can be used in many different combinations and applications
- Time-saving automatic operation
- Control panel fitted with automatic regulators
- Secures no freezing in the heat exchanger.

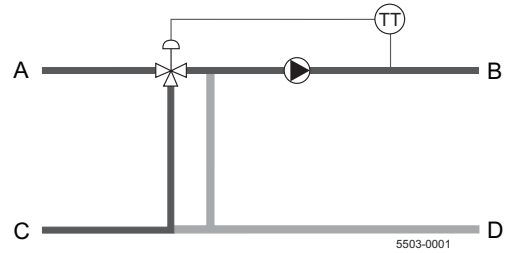
Benefits

- Straightforward installation with low-cost of ownership
- Pre-assembled, pre-configured set-up helps eliminate time-wasting and risk
- Takes up very little space
- Supplies the correct amount of cold water/glycol at the desired temperature. This ensures the best possible exploitation of the heat exchanger's capabilities and performance, and reduces consumption of cold water/glycol

Working principle

A circulation pump makes sure the full flow of cold water/ glycol gets to where it is needed in the heat exchanger. To achieve the required water/glycol temperature, a supply of fresh cold water/glycol is constantly fed into the circulation loop from the customer's cooling system.

The amount of glycol fed into this loop is regulated by a 3-way valve controlled by a temperature controller, or by the customer's own control panel/PLC system. The module secures correct forward temperature to avoid freezing in the heat exchanger. The set point can either be the temperature of the cold water/glycol leaving the actual cold water module, or the outlet temperature from the heat exchanger in which the cold water/glycol is used.



A = Cooling media IN
 B = To heat exchangers
 C = Cooling media OUT
 D = From heat exchanger

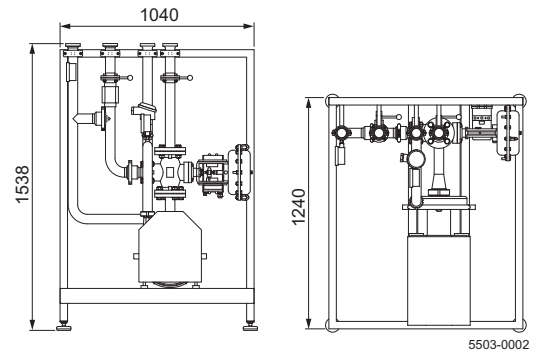
Technical data

Type	Cold water capacity [m³/h]	Cooling capacity [kW]	Δ t on cold water [°C]
Cold water module 1	10,000	108	10
Cold water module 2	20,000	216	10
Cold water module 3	30,000	324	10
Cold water module 4	40,000	432	10
Cold water module 5	60,000	648	10

Optional equipment

- Junction box where all electrical connections on the module are collected and terminated, making it easy to link them to external control panels
- Additional plate heat exchanger and auxiliary equipment that make it possible to use 2-phase cooling media
- Complete plug'n'play chiller solution

Dimensional drawing [mm]



Steam based hot water generator

Hot Water Module

5.6

Application

The Alfa Laval hot water module is designed to serve as the most efficient and reliable way to supply either hot or superheated water as a heating medium for all types of Alfa Laval heat exchangers.

This specialized module provides continuous heating and circulation of hot water below 100°C and superheated water above 100°C at a constant flow rate and at a constant temperature.

The module is ideal for use in conjunction with food processing installations in which hot water is used as the heating medium. It can also easily be combined with many other types of equipment, such as stand-alone heat exchangers, or be installed as part of a SteriTherm™ aseptic heat treatment system.

Design

The Alfa Laval hot water module is a pre-assembled skid-mounted unit designed and built specifically to ensure a steady supply of hot water with only minimal variations in temperature. This supply is automatically regulated by the combination of the steam regulating valve and the controller unit built into the control panel.

This hot water module includes a plate heat exchanger with stainless steel heat transfer plates, a hot water circulating pump powered by an electric motor, a steam regulating valve and condensate group, the appropriate instruments and internal piping, all installed on a stainless steel frame.

The hot water module is delivered skid-mounted as a complete pre-assembled unit that is easy to install close to the heat exchanger that uses the hot water, or in a suitable separate utility/boiler room.

This pre-configured set-up makes it easier, quicker and cost-efficient for the customer to ensure a reliable, consistent supply of hot water with pre-determined specifications. It reduces the risk, cost and delays often associated with ad hoc installations using individual items of equipment from different manufacturers. It makes the operation of heat exchangers more efficient and more consistent, thus helping boost quality results and reduce overall operating costs. Alfa Laval hot water modules can be customized to suit a wide range of specific operating needs as well as individual customer requirements.



Features

- Compact, modular design
- Can be used in many different combinations and applications
- Time-saving automatic operation
- Control panel fitted with automatic regulators.

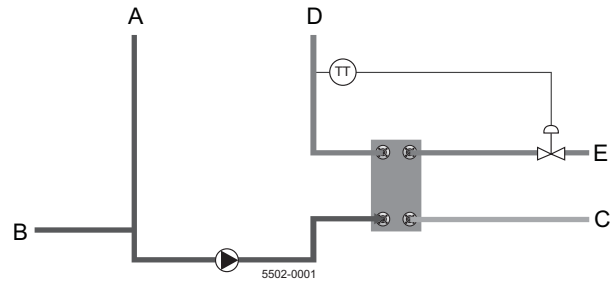
Benefits

- Straightforward installation with low cost of ownership
- Pre-assembled, pre-configured set-up helps eliminate time-wasting and risk
- Space-saving design with a small footprint
- Supplies the correct amount of heating water at the desired temperature. This ensures the best possible exploitation of the heat exchanger's capabilities and performance, and reduces steam consumption
- Reliable operation, due to self-adjusting steam regulation equipment.

Working principle

A circulation pump makes sure the full flow of hot water gets to where it is needed in the heat exchanger. To achieve the required water temperature, steam is used to heat the contents of the plate heat exchanger to the desired set point.

The amount of steam used is determined by a steam regulating valve controlled by a temperature controller, or by the customer's own control panel/PLC system. The set point can either be the temperature of the hot water leaving the actual hot water module, or the outlet temperature from the heat exchanger in which the hot water is used.



A = From heat exchangers
 B = Water
 C = Condensate
 D = To heat exchanger
 E = Steam

Technical data

Type	Hot water capacity [m ³ /h]	Heating capacity [kW]	Δ t on hot water [°C]	Steam consumption [kg per hour]
Hot water module 1	1.000	31	25	50
Hot water module 2	5.000	94	16	150
Hot water module 3	10.000	156	13	250
Hot water module 4	15.000	250	13	400
Hot water module 5	20.000	313	13	500
Hot water module 6	30.000	469	13	750
Hot water module 7	40.000	625	13	1.000
Hot water module 8	60.000	938	13	1.500
Hot water module 9	80.000	1.250	13	2.000

The maximum hot water temperature available from standard-configured Alfa Laval hot water modules is 150 °C. If higher temperatures are required, modules can be customized to suit these specific needs

Optional equipment

- Junction box where all electrical connections on the module are collected and terminated, making it easy to link them to external control panels
- Automatic on/off valve for steam and water connections/ tie-ins can be included

Dimensional drawing [mm]

