5.3

Pharma-X

Pharma-X Point-of-use Cooler for Pharmaceutical Water Systems

Applications

The Alfa Laval Pharma-X is a compact point-of-use cooler for Water For Injection (WFI) or Purified Water (PW) systems. The Pharma-X meets the stringent hygiene standards imposed by both control authorities and industry.

For quick and easy installation, the Pharma-X point-of-use cooler is supplied as a complete insulated module with a pitot tube arrangement and either manual or automatic valves. Installed in a water system, the Pharma-X module can be regarded as a sub-loop of the main loop.

Working principles

To maintain optimum sanitary conditions when the point-of-use cooler is in 'stand-by' mode, hot water from the main loop enters via the pitot tube and flows continuously through the point-of-use cooler and back to the main loop (fig. 1).

Switching from 'stand-by mode' to 'cooling mode' (fig. 2) enables cold WFI or PW to be withdrawn within a few seconds.

It is also possible to withdraw hot WFI or PW at the point of use.

The low hold up volume, and the quick response of the heat exchanger, ensures that waste of WFI or PW is minimised. The cooling water demand is very low thanks to the efficient heat transfer.

PHYSICAL DATA

Connections:	Tri-clamps metric or ANSI
Material:	316 L stainless steel, seamless tubes
Pharma-X module:	Insulation: Armaflex Cladding: 304L electropolished
Weight of module:	22-46 kg

TECHNICAL DATA

Max flow rate:	1500 l/h
Heat transfer area:	0.3-1.0 m^2
Surface finish:	Ra < 0.5 µm. Electropolished on all product wetted parts
Welding according to:	EN 287 and ASME IX
Design pressure:	10 barg
Design temperature:	150 °C
Pressure vessel code:	N/A

Hygienic design
The Pharma-X is based on an innovative tube-in-tube design. All product wetted parts in the Pharma-X are electropolished and the tubes are seamless.

If needed, the Pharma-X is easy to clean and it can be steam sterilized.

There are no internal welds in the Pharma-X, eliminating the risk of cross contamination between the product and the service medium.

The Pharma-X is fully drainable on the product side, with no dead legs in the complete module.

Lower total pressure drop
The Pharma-X pitot tube arrangement ensures that throttling valves are not needed at every sub-loop, significantly reducing the total pressure drop of the water system.

Minimum maintenance
The Pharma-X is virtually maintenance free with no internal gaskets. This reduces the downtime of the water system to a minimum.

Standard sizes
There are six standard Pharma-X models - TT 311, TT 3151, TT 312 and TT 3152. These are supplied either as complete modules or as stand alone heat exchangers.

Documentation
The Pharma-X is delivered along with a standard documentation including drawings, material certificates, operation and maintenance manual, pressure test certificate, welder's certificates, etc.

Pitot tube for connection to the water system.

Pharma-X module installed as a point-of-use cooler at AstraZeneca, Sweden.

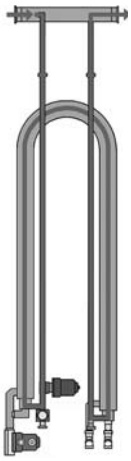


Fig 1. Stand-by mode:
The Pitot tube ensures that the product is kept circulating in the point-of-use cooler, keeping it sanitized.

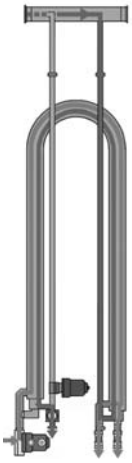
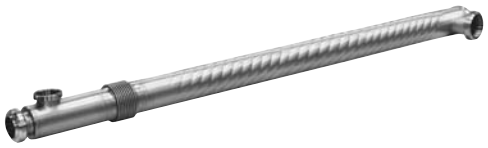


Fig 2. Cooling mode:
The cooling water valve opens. The recirculation valve is closed and the product flows in the opposite direction. Cold water is available within seconds.

5.3

The tubular heat exchanger series from Alfa Laval

ViscoLine™ Monotube Unit

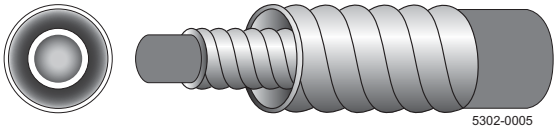


Applications
The ViscoLine™ Monotube unit is a tube-in-tube heat exchanger The Monotube is especially used for grape mash, diced tomato, diced vegetable and diced fruits and also sauces and soups that contain particles. Can also be used for the heating, cooling and pasteurization of products with low and average viscosity that contains fibres, particles.

Standard design
The ViscoLine Monotube heat exchanger consists of a single tube mounted inside an outer shell tube. The product medium flows inside this tube, and the service medium around it. It is a fully welded construction with a bellow on shell tube to absorb thermal expansion. ViscoLine Monotube modules are normally connected in series and mounted on support frame or full frame.

Working principles
The product medium inside the tube flows in counter current to the service medium. The product tube is corrugated or it can be smooth. The shell tube is always corrugated. The installation is maintenance free, thus eliminating any need for spare parts.

Standard materials
Product side (tubes): . . .Stainless steel AISI 316
Service side (shell): . . . .Stainless steel AISI 304 or AISI 316L (optional)
Frame: . . . . . .Stainless steel AISI 304 (units can be angled for self-draining on request)
Other materials are available on request.



Graphic representation of the flow pattern in the ViscoLine Monotube Unit.

Technical data
Mechanical design pressure
The ViscoLine Monotube unit was designed for a pressure of 15 barg on the product side (tube) and 10 barg on the service side (shell), depending on the connection. The unit can, however, accommodate higher pressure ratings, depending on component thickness and connection type.

The ViscoLine Monotube unit complies with the European Pressure Equipment Directive (PED), and is entitled to bear the CE mark, though depending on the design of the connections.

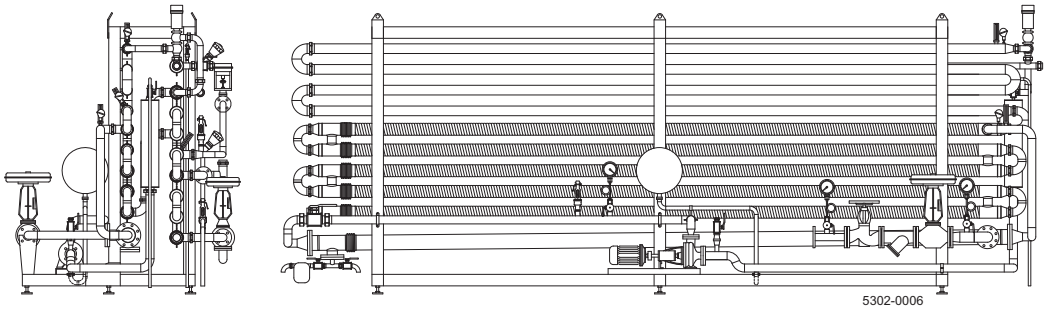
It is designed to operate at a temperature of 160°C. All units are provided with an expansion joint to absorb any thermal expansion stresses that arise.

Connections
Product side (tubes): . . . . . SMS
DIN 11851
Tri-Clamp
Flange
Service side (shell): . . . . . SMS
DIN 11851
Tri-Clamp
Flange

Options
- Protection sheets
- Insulation
- Shell in steel grade AISI 316L

Other pressure and temperature ratings on request

ViscoLine VLO as single tube



ViscoLine VLO on a full frame

Designation

VLO 51/76-6-316L/304-C :

VLO:	ViscoLine Monotube
51:	outer diameter of product tube
76:	outer diameter of service shell
6:	module length (m)
316L:	material product side (tube)
304:	material service side (shell)
C:	corrugated inner tube
S:	smooth inner tube

All types are also available in 3 meter length

Type	Volume in product tube [litres]	Heat transfer area [m^2]
VLO 16/25-6	0.92	0.28
VLO 20/38-6	1.53	0.36
VLO 25/40-6	2.49	0.45
VLO 28/52-6	2.95	0.50
VLO 34/52-6	4.53	0.61
VLO 38/63-6	5.81	0.69
VLO 40/63-6	6.45	0.73
VLO 38/70-6	5.81	0.69
VLO 40/70-6	6.45	0.73
VLO 51/76-6	10.8	0.93
VLO 52/76-6	11.3	0.95
VLO 51/85-6	10.8	0.93
VLO 52/85-6	11.3	0.95
VLO 63/89-6	16.7	1.16
VLO 70/89-6	20.5	1.28
VLO 70/102-6	20.5	1.28
VLO 70/104-6	20.5	1.28
VLO 76/104-6	24.5	1.40
VLO 76/114-6	24.5	1.40
VLO 85/114-6	30.9	1.56
VLO 76/129-6	24.5	1.40
VLO 85/129-6	30.9	1.56
VLO 102/140-6	44.9	1.88
VLO 102/154-6	44.9	1.88

5.3

The tubular heat exchanger series from Alfa Laval

ViscoLine™ CIP Unit

Applications

The ViscoLineTM CIP unit is ideal for heating of water or CIP solutions by means of steam, less demanding applications to process low and average viscosity products. Products can contain fibres and small particulates. Also suitable for general heating and cooling applications.

Working principle

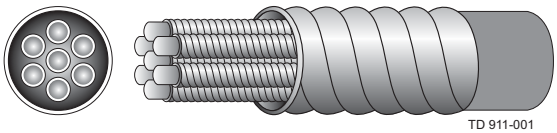
The heat exchanger is formed by a tube bundle (welded at both ends onto flat tube plates) inside a shell.
Product medium flows inside the tubes of the bundle and the service medium between and around these tubes.
This makes it compact and easy to install.

All tubes are connected in parallel and in counter-current flow to the service medium. The product tubes are corrugated. The service media shell is smooth.

Standard materials

Product side (tubes): . . . . . AISI 316
Service side (shell): . . . . . AISI 304

Vertical installation is recommended for steam to water heating



Graphic representation of the flow pattern in the ViscoLine CIP Unit.

Standard design

ViscoLine CIP and water heater is available in 4 sizes.

Technical data

Mechanical design pressure

10 bar on tubes and shell side. Complies with the European Pressure Equipment Directive (PED).
Design temperature 150°C.

Connections

Product side (tubes): . . . . . DIN standard flanges
Service side (shell): . . . . . DIN standard flanges

Designation

VLC19x18/129-2.0-316/304-H

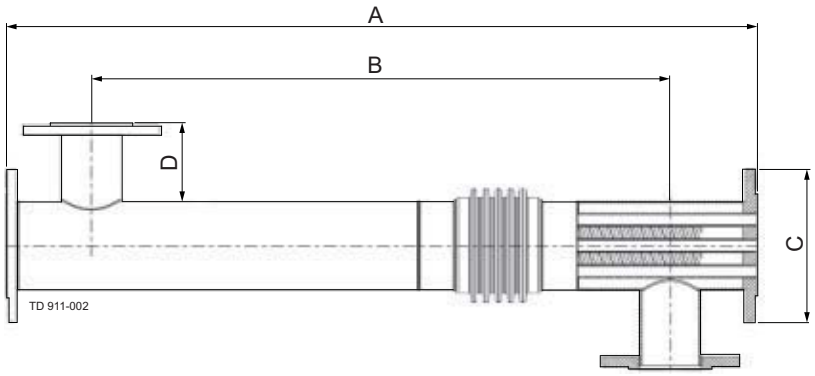
VLC:	ViscoLine CIP
19	Number of tubes
18	Outer diameter of product tubes (mm)
129	Outer diameter of service shell (mm)
2.0	Module length (m)
316	Material tube side
304	Material shell side
H	Tubes are hard corrugated

Welded flat tube plate at both ends

Designation

Type	Nr. of tubes	Tube ø mm [mm]	Shell ø mm [mm]	Module lenght [mm]	Volume tubes [liters]	Article nr.
VLC13x18/104-2,0	13	18	104	2.0	5.20	10060404
VLC19x18/129-2,0	19	18	129	2.0	7.60	10060403
VLC37x18/168-2,0	37	18	168	2.0	14.9	10060406
VLC37x18/168-3,0	37	18	168	3.0	22.3	10060409

Type	A [mm]	B [mm]	C [mm]	D [mm]	Shell side	Tube side
VLC13x18/104-2,0	1939	1690	200	114	DN65	DN80
VLC19x18/129-2,0	1939	1690	220	115	DN80	DN100
VLC37x18/168-2,0	1939	1677	285	115	DN80	DN150
VLC37x18/168-3,0	2939	2677	285	115	DN100	DN150



5.3

The tubular heat exchanger series from Alfa Laval

ViscoLine™ Multitube Unit

Applications

The ViscoLineTM Multitube unit is ideal for the heating, cooling and pasteurization of products with low and medium viscosity, and products that contain fibres and small particulates.

These units are used in conjunction with a wide range of products, including milk, cream water, yellow fats, whole egg, egg white, egg yolk, fruit purée, baby food, many kinds of fruit juices containing pulp and fibres, fruit concentrates, beer mash, tomato juice and nectar, protein solutions, yeast and soft drinks.

Standard design

The ViscoLine Multitube unit consists of a bundle of tubes mounted inside an outer shell, and welded onto tube plates at both ends. The product medium flows inside these tubes, and the service medium between and around them.

All the product tubes are connected in parallel and the flow is counter-current in relation to the service medium.

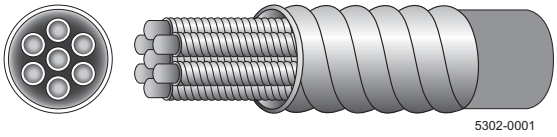
As standard inner tubes and shell tube are corrugated to increase heat transfer efficiency. ViscoLine Multitube modules are normally connected in series and mounted on support frame or full frame.

The installation is maintenance free, thus eliminating any need for spare parts.

Standard materials

Product side (tubes): . . .Stainless steel AISI 316L
Service side (shell): . . . .Stainless steel AISI 304 or AISI 316L (optional)
Frame: . . . . . .Stainless steel AISI 304 (units can be angled for self-draining on request)

Other materials are available on request is 254 SMO, inner tubes and tube plate. (Bends in AISI 316L)



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Graphic representation of the flow pattern in the ViscoLine Multitube Unit

Working Principle

ViscoLine Multitube is a highly efficient tubular heat exchanger that incorporates corrugated tubes or other advanced profiles designed to increase turbulence in the flow of the fluid. This substantially increases the overall heat transfer coefficient

Technical data

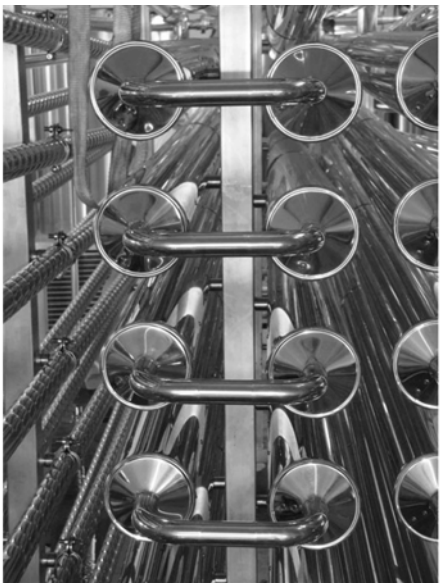
Mechanical design pressure

The ViscoLine Multitube Unit is designed for a pressure of 15 bar on the product side (tubes) and 10 bar on the service side (shell), depending on the connection. The unit can, however, accommodate higher pressure ratings, depending on component thickness and connection type.

The ViscoLine Multitube unit complies with the European Pressure Equipment Directive (PED), and is entitled to bear the CE mark, though depending on the design of the connections. Where the CE mark is not required, ViscoLine Multitube will be manufactured according to good engineering practice.

It is designed to operate at a temperature of 160°C. All units are provided with an expansion joint to absorb any thermal expansion stresses that arise.

Connections Product side (tubes): . . . SMS
DIN 11851
Tri-Clamp
Flange
Service side (shell): . . . . . SMS
DIN 11851
Tri-Clamp
Flange



The ViscoLine tubular heat exchanger connected in series with insulation.

Options

- Protection sheets
- Thermal insulation
- Shell in steel grade AISI 316

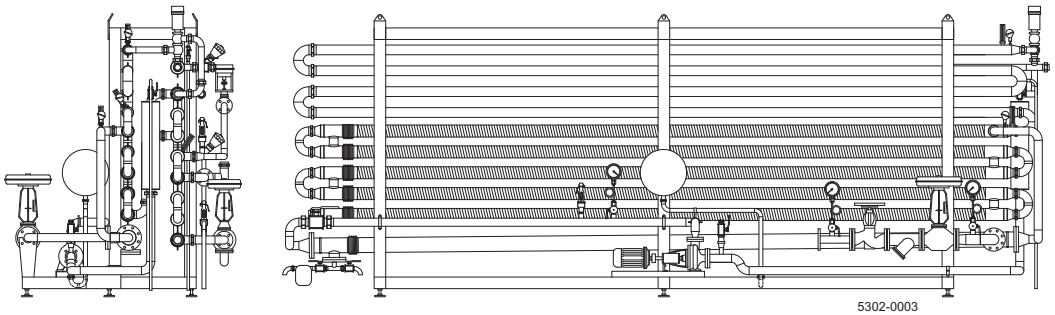
Designation

VLM19x25/154-6.0-316L/304-C

VLM:	ViscoLine Multitube
19:	number of product tubes
25:	outer diameter of product tubes
154:	outer diameter of service shell
6.0:	module length (m)
AISI 316L:	material product side (tube)
AISI 304:	material service side (shell)
C:	corrugated inner tubes
S:	smooth inner tubes

All types are also available in 3 meter length.

Type	Heat transfer area [m²]
VLM 3x14/40-6	0.74
VLM 5x14/52-6	1.23
VLM 4x16/52-6	1.13
VLM 7x14/63-6	1.72
VLM 5x16/63-6	1.41
VLM 9x14/70-6	2.21
VLM 7x16/70-6	1.98
VLM 4x20/70-6	1.43
VLM 13x14/76-6	3.19
VLM 9x16/76-6	2.54
VLM 16x14/85-6	3.92
VLM 12x16/85-6	3.39
VLM 7x20/85-6	2.51
VLM 4x25/85-6	1.79
VLM 17x14/89-6	4.17
VLM 13x16/89-6	3.68
VLM 21x14/102-6	5.15
VLM 15x16/102-6	4.24
VLM 24x14/104-6	5.88
VLM 20x16/104-6	5.65
VLM 12x20/104-6	4.30
VLM 7x25/104-6	3.14
VLM 30x14/114-6	7.35
VLM 22x16/114-6	6.22
VLM 12x25/114-6	5.38
VLM 37x14/129-6	9.07
VLM 26x16/129-6	7.35
VLM 19x20/129-6	6.80
VLM 15x25/129-6	6.73
VLM 35x16/140-6	9.90
VLM 37x16/154-6	10.46
VLM 19x25/154-6	8.52
VLM 55x16/168-6	15.55
VLM 23x25/168-6	10.40



Alfa Laval ViscoLine Multitube system - example

5.3

The tubular heat exchanger series from Alfa Laval

ViscoLine™ Annular Unit

Applications

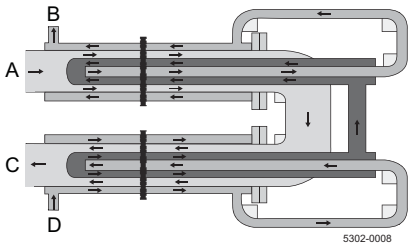
The ViscoLineTM Annular heat exchanger (VLA) is ideal for the heating, cooling and pasteurization of non-Newtonian products with high viscosity, and products that contain particulates. These units are most commonly used in conjunction with low acid products with average/high viscosity, such as tomato concentrate, banana paste, sourdough, chocolate sauce, mayonnaise, malt extract and tomato-based sauces in general.

Standard design

The VLA unit consists of four concentric tubes. The product medium flows in between two service channels, and is heated or cooled from the inside and outside at the same time. The unit features easy, full inspection of the product side by removing the tube insert. The outer shell is corrugated and the other three concentric tubes are not corrugated, smooth. If required, the product tube can be corrugated. To achieve a more even temperature on the product, static mixers can be welded on outside the third concentric tube. ViscoLine Annular heat exchangers are connected in series on product side and in parallel on water/service side and grouped on support frame or full frame.

Working principles

The product medium runs in between the second and the third concentric tube and is counter-current relation to the service medium. The only spare parts needed are the O-rings in the header. There is a maximum gap on the product side of 49.2 mm and a minimum gap of 5.8 mm.



A = Product in
B = Media out
C = Product out
D = Media in

Standard materials

Product side (tubes) . . .Stainless steel AISI 316L
Service side (shell) . . . .Stainless steel AISI 304 or AISI 316L (optional)
Frame . . . . . .Stainless steel AISI 304 (units can be angled for self-draining on request)

Other material available on request is 254 SMO on product side.
Product bends in AISI 316L

Technical data

Mechanical design pressure The ViscoLine Annular unit was designed for a pressure of 15 barg on the product side (tubes) and 10 barg on the service side (shell), depending on the connection and size. The unit can, however, accommodate higher pressure ratings up to 100 bar, depending on component thickness and connection type.

The ViscoLine Annular Unit complies with the European Pressure Equipment Directive (PED), and is entitled to bear the CE mark, though depending on the design of the connections. Where the CE mark is not required, ViscoLine Annular will be manufactured according to good engineering practice.

It is designed for a temperature of 160°C. All units are provided with an expansion joint to absorb any thermal expansion stresses that arise

Connections

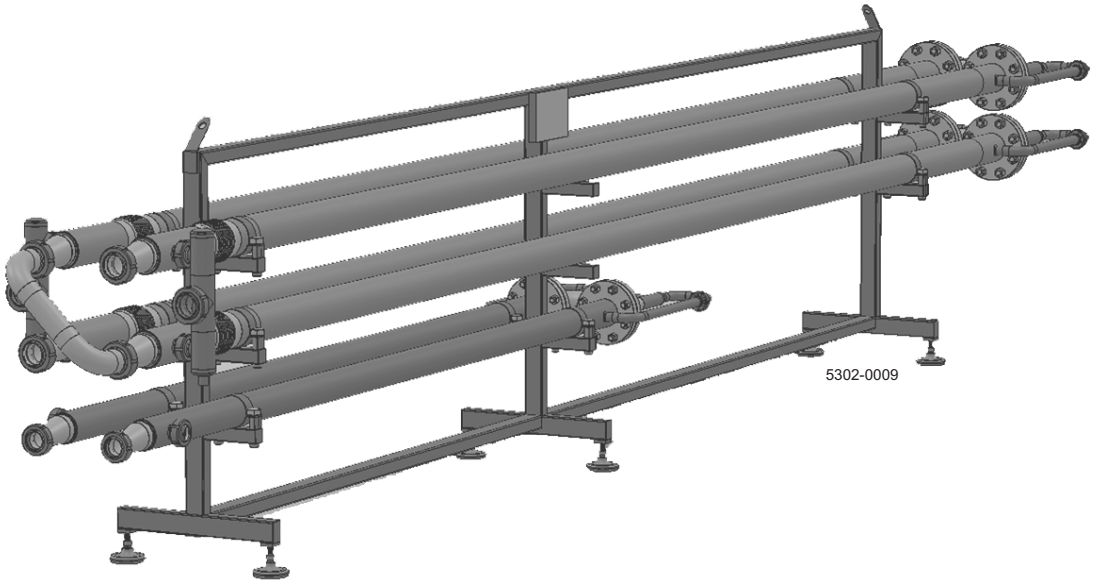
Product side (tubes) . . .SMS
DIN 11851
Tri-Clamp
Flange
Service side (shell) . . . .SMS
DIN 11851
Tri-Clamp
Flange

Options
- Protection sheets
- Insulation
- Shell in steel grade AISI 316L
- Other pressure and temperature ratings on request

Designation
VLA 52/70/114/129-6.0-316L/304

VLA:	ViscoLine Annular
52:	1 st tube diameter
70:	2 nd tube diameter
114,3:	3 rd tube diameter
129:	4 th and outer diameter of service shell
6.0:	module length (meter)
316L:	material product side (tube)
304:	material service side (shell)

All types are also available in 3 meter length.



Type	Gap [mm]	Volume in product gap [litres]	Heat transfer area [m²]
VLA 16/25/40/52-6	5.8	3.6	1.10
VLA 25/34/52/63-6	7.5	6.2	1.48
VLA 18/28/52/63-6	10.5	8.1	1.37
VLA 28/40/63/76-6	9.8	9.7	1.78
VLA 25/38/63/76-6	10.7	10.4	1.75
VLA 25/34/63/76-6	12.8	11.9	1.68
VLA 20/28/63/76-6	15.8	13.7	1.57
VLA 40/60/76/85-6	5.9	7.8	2.37
VLA 34/52/76/85-6	10.1	12.4	2.24
VLA 34/51/76/85-6	10.7	13.1	2.22
VLA 34/48/76/85-6	11.9	14.3	2.15
VLA 28/40/76/85-6	16.1	17.9	2.02
VLA 25/38/76/85-6	17.0	18.7	1.99
VLA 25/34/76/85-6	19.1	20.2	1.91
VLA 20/28/76/85-6	22.1	22.0	1.81
VLA 40/63/85/102-6	8.8	12.6	2.59
VLA 40/60/85/102-6	10.4	14.6	2.53
VLA 34/52/85/102-6	14.5	19.2	2.40
VLA 34/51/85/102-6	15.1	19.9	2.38
VLA 28/48/85/102-6	16.4	21.1	2.34
VLA 28/40/85/102-6	20.5	24.7	2.19
VLA 25/38/85/102-6	21.5	25.5	2.16
VLA 25/34/85/102-6	23.5	27.0	2.08
VLA 20/28/85/102-6	26.5	28.8	1.97
VLA 40/70/89/102-6	7.5	11.5	2.78
VLA 40/63/89/102-6	10.7	15.8	2.67
VLA 40/60/89/102-6	12.3	17.8	2.61
VLA 34/52/89/102-6	16.5	22.5	2.48
VLA 34/51/89/102-6	17.1	23.1	2.46
VLA 28/48/89/102-6	18.3	24.3	2.41
VLA 28/40/89/102-6	22.5	28.0	2.26
VLA 25/38/89/102-6	23.4	28.7	2.23
VLA 25/34/89/102-6	25.5	30.2	2.16
VLA 20/28/89/102-6	28.5	32.0	2.05
VLA 34/60/89/102-6	11.3	16.1	2.53
VLA 34/60/89/102-6	10.3	14.5	2.46
VLA 28/48/89/102-6	16.3	21.0	2.28
VLA 28/48/89/102-6	14.8	18.6	2.19
VLA 52/85/102/114-6	6.3	11.5	3.25
VLA 52/76/102/114-6	10.7	18.5	3.13
VLA 52/70/102/114-6	13.8	23.1	3.02
VLA 40/63/102/114-6	17.1	27.4	2.91
VLA 40/60/102/114-6	18.7	29.4	2.85
VLA 34/52/102/114-6	22.8	34.0	2.72
VLA 34/51/102/114-6	23.4	34.6	2.70
VLA 28/48/102/114-6	24.7	35.9	2.65
VLA 28/40/102/114-6	28.8	39.5	2.50
VLA 52/89/114/129-6	10.7	21.3	3.56
VLA 52/85/114/129-6	12.7	24.6	3.49
VLA 52/76/114/129-6	17.1	31.7	3.37
VLA 52/70/114/129-6	20.2	36.2	3.26
VLA 40/63/114/129-6	23.4	40.6	3.14
VLA 40/60/114/129-6	25.0	42.5	3.09
VLA 34/52/114/129-6	29.2	47.2	2.94
VLA 28/48/114/129-6	31.0	49.0	2.87
VLA 28/40/114/129-6	35.2	52.7	2.72
VLA 52/89/114/129-6	8.7	16.9	3.45
VLA 52/89/114/129-6	7.2	13.8	3.34
VLA 52/76/114/129-6	15.1	27.5	3.22
VLA 52/70/114/129-6	18.2	31.9	3.15
VLA 52/60/114/129-6	23.0	38.2	2.98
VLA 70/114/140/154-6	10.7	26.7	4.50
VLA 70/102/140/154-6	17.1	40.4	4.27
VLA 70/89/140/154-6	23.4	52.4	4.04
VLA 70/85/140/154-6	25.4	55.8	3.97
VLA 52/76/140/154-6	29.8	63.0	3.85
VLA 52/70/140/154-6	32.9	32.9	3.74
VLA 70/89/140/154-6	19.6	42.3	3.86
VLA 70/89/140/154-6	19.6	42.3	3.81

Type	Gap [mm]	Volume in product gap [litres]	Heat transfer area [m²]
VLA 85/129/154/168-6	10.5	29.2	5.03
VLA 70/114/154/168-6	17.9	47.1	4.77
VLA 70/102/154/168-6	24.2	60.7	4.54
VLA 70/89/154/168-6	30.6	72.8	4.31
VLA 129/168/206/219-6	15.9	58.2	6.68
VLA 102/140/206/219-6	30.2	102.2	6.16
VLA 102/129/206/219-6	35.5	116.5	5.97
VLA 89/114/206/219-6	42.9	134.3	5.71
VLA 85/102/206/219-6	49.2	148.0	5.48
VLA 70/168/206/219-6	30.2	102.2	6.68
VLA 70/140/206/219-6	15.9	58.2	6.16

Sanitary Heat Exchanger for Membrane Filtration Systems

Multitube Heat Exchangers

Multitube heat exchangers are used to heat or cool products in membrane filtration plants. These heat exchangers are made of stainless steel (AISI 316L), in a sanitary design. All materials comply with FDA regulations.

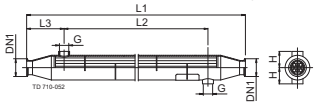
The multitube heat exchangers are available in two standard sizes: 1 m^2 and 2 m^2. They consist of an external pipe placed around 34 pipes (1 m^2) or 60 pipes (2 m^2). The cooling/heating medium flows on the outside of these pipes.

Customized dimensions and connections are available on request.

Technical Data

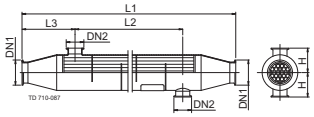
Multitube Heat Exchanger - 1 m^2

Example of cooling capacity: 1 kW/°C, 15 m^3/h product flow, 1 cP viscosity, and 1 m^3/h cooling flow.



Multitube Heat Exchanger - 2 m^2

Example of cooling capacity: 2.3 kW/°C, 75 m^3/h product flow, 1 cP viscosity, and 3 m^3/h cooling flow.



Code no.	1 m^2 104878	2 m^2 104880
Maximum pressure		
Product	30 bar (3.0 MPa)	30 bar (3.0 MPa)
Medium	10 bar (1.0 MPa)	10 bar (1.0 MPa)
Temperature		
Min.	1°C	1°C
Max.	80°C	80°C
Heat transfer area	1 m^2	2 m^2
Liquid volume in litres		
Product	3	8
Medium	4	6
Weight kg	15	24
L1 (mm)	1200	1254
L2 (mm)	930	870
L3 (mm)	135	192
H (mm)	58	90
Product DN1‘	Diameter 51 mm 2" ISO 2852 clamp	Diameter 76 mm 3" ISO 2852 clamp
Medium		
DN2	-	Diameter 51 mm 2" ISO 2852 clamp
G	1" BSP female	-
Number of pipes	34	60

Product code:

5.3

Name	Ra<0.8	El-polished, Ra <0.5	El-polished, Ra <0.4	Add on	
				Insulation	Removable tube bundle
	RCPL EUR	RCPL EUR	RCPL EUR	RCPL EUR	RCPL EUR
Pharma-line 1 - 0.1 Pharma-line 1 - 0.3 Pharma-line 1 - 0.4 Pharma-line 1 - 0.6 Pharma-line 1 - 0.7 Pharma-line 1 - 0.8 Pharma-line 1 - 1.1 Pharma-line 1 - 1.2 Pharma-line 1 - 2.5					
Pharma-line 2 - 0.3 Pharma-line 2 - 0.6 Pharma-line 2 - 1.0 Pharma-line 2 - 1.3 Pharma-line 2 - 1.4 Pharma-line 2 - 1.7 Pharma-line 2 - 2.4 Pharma-line 2 - 2.6 Pharma-line 2 - 5.5					
Pharma-line 3 - 0.4 Pharma-line 3 - 1.0 Pharma-line 3 - 1.6 Pharma-line 3 - 2.0 Pharma-line 3 - 2.2 Pharma-line 3 - 2.7 Pharma-line 3 - 3.7 Pharma-line 3 - 4.0 Pharma-line 3 - 8.5					

When ASME U-stamp is needed this must be added to the price!
Always add cost of ASME U-stamp to models: 1-1.2, 1-2.5, 2-2.6, 2-5.5, 3-4.0 and 3-8.5 when ordering ASME. U-stamp is not needed for PED

	RCPL EUR
U-stamp, first unit U-stamp, second unit if identical to first unit and in the same order and the same delivery time U-stamp, second unit if different from first unit	

Type*	Product flow rate (l/h) at max product dP=110kPa	No. of pass	Heat transfer area m^2	Insulation	Cladding	Valves	Pitot Tube	RCPL EUR
Naked unit								
TT 311	1500	single	0.3	no	no	no	no	
TT 3151	1100	single	0.5	no	no	no	no	
TT 312	900	double	0.6	no	no	no	no	
TT 3152	700	double	1.0	no	no	no	no	
Module								
TT 311	1500	single	0.3	yes	yes	yes	yes	
TT 3151	1100	single	0.5	yes	yes	yes	yes	
TT 312	900	double	0.6	yes	yes	yes	yes	
TT 3152	700	double	1.0	yes	yes	yes	yes	

When ordering a unit you need to specify Code no. and if the unit should be as a module or as a naked unit.

Standard documentation included in the delivery: Drawings, material and surface finish certificates, weld log and welders certificates, operation manual and pressure test certificates.

* The denomination system is:

- TT (tube-in-tube) / Type 3 / 1 or 1.5 meter tube height / 1 or 2 U-tubes (passes).

	RCPL EUR
Stainless steel cooling water valve	
Pneumatic Point-of-use valve	
Stroke limiter for pneumatic point-of-use valve	
Jumo surface thermometer / Pt 100. Note -a transmitter is not included.	
Customized text on name plate	
Customer inspection at factory. Price is per day.	
One separate pitot tube	
One separate pitot tube with isolation valves Drawing. Rm10-002	
When ordering a Pharma-X module: isolation valves on the pitot tube. Drawing Rm10-002	
Return bend, Option 2, Drawing Rm10-002	
Return bend with sample valve, Option 1, Drawing Rm10-002	
Manufacturing Planning Schedule	
One (1) approval drawing to customer	

Product code: See below

Item No.	RCPL EUR	Description
Product code: 6501		**Multitube heat exchanger**
104877		Heat Exchanger 0.21 m^2 60 bar
104878		Heat Exchanger 1 m^2 51 mm clamp, 316L
104880		Heat Exchanger 2 m^2 76/51 mm clamp, 316L