

Alfa Laval Pharma-line

Double tube sheet shell and tube heat exchanger

Introduction

Pharma-line is a double tube sheet shell & tube heat exchanger intended for heating and cooling of pharmaceutical water systems.

Application

The Pharma-line is a high-quality tubular heat exchanger designed to operate in the pharmaceutical and biotech industries.

There are different executions available for different duties and demands. All Pharma-line products are designed in-line with regulations within this industry and is compliant with USP and cGMP requirements

It is suitable for heating and cooling of products intended for the pharmaceutical industry, mainly Water For Injection (WFI) and Purified Water (PW) and some non-viscous pharmaceutical products.

Benefits

- Designed with focus on hygienic demands
- Leak detection by double tube sheet design
- Q-doc as standard



Technical data (standard)

Heat transfer area:	0.1 – 8.5m ² (1.07 – 91.5 sqft)	
Flow rate:	Pharma-line S & Pharma-line P	0.3m ³ /h – approx. 42m ³ /h (79 gph – approx. 11100 gph)
	Pharma-line P non-standard	for higher flow rate available on request
Design temperature:	Pharma-line S	-10°C – 150°C (14°F – 302°F)
	Pharma-line P	-10°C – 200°C (14°F – 392°F)
Design pressure:	Pharma-line S	FV/10 barg (FV/145 psig)
	Pharma-line P	FV/15barg(FV/218psig)
Pressure equipment certification:	PED, Chinese TSG ASME VIII, only Pharma-line P (U-stamp as option)	

Material data

Product wetted parts:	stainless steel 316L
Other parts:	Stainless steel 304
Gasket:	PTFE (FDA compliance and USP class IV certified)
Surface finish product wetted parts:	Mechanically polished Ra<0,8µm (Only Pharma-line P)
	Mechanically polished with Ra<0,5µm
	Electropolished with Ra<0,4µm

Standard design and configuration

The Pharma-line double tube sheet shell & tube heat exchanger series is designed with a focus on the hygienic standards, performance and reliability to meet the Pharmaceutical industries demands.

The standard configuration of Pharma-line is a U-tube design that suits most applications. A U-tube design means less footprint needed, compare to a straight tubular heat exchanger.

There are no dead areas in the Pharma-line and it is fully drainable on the product side. The tubes used in the heat exchanger are seamless with smooth and controlled surface to minimize risk of contamination.

All products wetted parts, the tube, chamber, product connections are made of 316L stainless steel. The gasket in contact with the product is made of PTFE material which is FDA compliant and USP class VI certified.

Pharma-line is available in 2 different product ranges:

Pharma-line S

- standardized products with predefined options. Are available with pressure equipment certification, PED or Chinese TSG. The unit can either be non-insulated or insulated with mineral wool (ASTM C795) with stainless steel 304 cladding.
- Pharma-line S is equipped with movable legs to facilitate installation, the product can be installed either horizontally or vertically.

Pharma-line P

- available with standard selection with several options to select among and as a complete customized design available upon request.
- Options Pharma-line P
 - Insulation mineral wool (ASTM C795) with stainless steel 304 cladding
 - Removable tube bundle
 - Passivation
 - 1 pass, 2-pass or 4-pass designs
 - Connections standard and sizes
 1. Product side: Clamp: ASME BPE, DIN32676, DIN11864, ISO2852
 2. Utility side: Flanges: ANSI B16.5 (150lbs, 300 lbs), DIN2635/EN1092-1
 - Pressure equipment certification, PED, ASME, TSG

Documentation

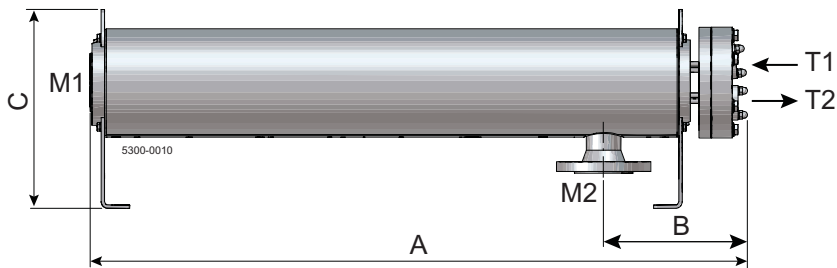
All Pharma-line products are delivered along with Alfa Laval Q-doc including:

- Approved drawings
- welding procedures (WPS), welder qualification (WPQ), weld log
- 3.1 Material certificates, pressure & product wetted steel parts
- Gaskets FDA compliance and USP class VI certificates
- Liquid penetrant test report
- Dimensional control report
- Pressure test certificate signed by Notified body
- Identification (technical sign)
- Quality system certificate
- Declaration of compliance
- CE documents
- Instruction Manual

Dimensional drawing, Pharma-line S

Measures are approximate

Type	OD	Nozzle size Tube	Nozzle size flanges	A	B	C
Pharma-line S 1	mm	mm	mm	mm	mm	mm
Pharma-line S 1-0.1	73	1"	DN50	1150	225	350
Pharma-line S 1-0.3	89	1"	DN50	1150	225	350
Pharma-line S 1-0.4	102	1"	DN50	1150	225	350
Pharma-line S 1-0.6	114	1 1/2"	DN50	1150	230	350
Pharma-line S 1-0.7	140	2"	DN80	1150	260	410
Pharma-line S 1-0.8	114	1 1/2"	DN50	1150	256	347
Pharma-line S 1-1.1	140	2"	DN80	1150	260	410
Pharma-line S 1-1.2	168	2"	DN80	1150	260	410
Pharma-line S 1-1.9	168	2"	DN80	1155	291	409
Pharma-line S 1-2,1	219	2"	DN125	1165	310	521
Pharma-line S 1-2,5	219	3"	DN150	1165	312	521
Pharma-line S 2						
Pharma-line S 2-0.3	73	1"	DN50	2150	225	350
Pharma-line S 2-0.6	89	1"	DN50	2150	225	350
Pharma-line S 2-1.0	102	1"	DN50	2150	225	350
Pharma-line S 2-1.3	114	1 1/2"	DN50	2150	230	350
Pharma-line S 2-1.4	140	2"	DN80	2150	260	410
Pharma-line S 2-1.7	114	1 1/2"	DN50	2150	256	347
Pharma-line S 2-2.4	140	2"	DN80	2150	260	410
Pharma-line S 2-2.6	168	2"	DN80	2150	260	410
Pharma-line S 2-4,1	168	2"	DN80	2155	291	409
Pharma-line S 2-4,8	219	2"	DN125	2166	310	521
Pharma-line S 2-5,5	219	3"	DN150	2165	312	521
Pharma-line S 3						
Pharma-line S 3-0.4	73	1"	DN50	3150	225	350
Pharma-line S 3-1.0	89	1"	DN50	3159	225	350
Pharma-line S 3-1.6	102	1"	DN50	3150	225	350
Pharma-line S 3-2.0	114	1 1/2"	DN50	3150	230	350
Pharma-line S 3-2.2	140	2"	DN80	3150	260	410
Pharma-line S 3-2.7	114	1 1/2"	DN50	3150	256	347
Pharma-line S 3-3.7	140	2"	DN80	3150	260	410
Pharma-line S 3-4.0	168	2"	DN80	3200	260	410
Pharma-line S 3-6,4	168	2"	DN80	3155	291	409
Pharma-line S 3-7,4	219	2"	DN125	3165	310	521
Pharma-line S 3-8,5	219	3"	DN150	3165	312	521

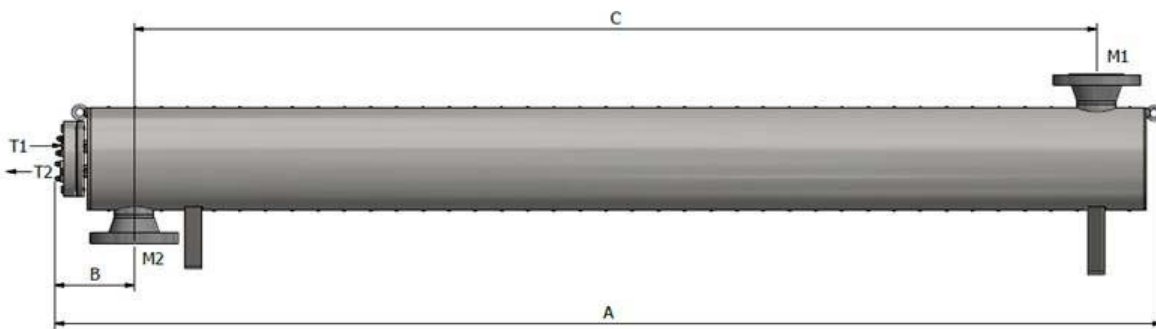


Item	Service	Facing
T1	Tube inlet	Tri-clamp
T2	Tube outlet	Tri-clamp
M1	Shell inlet	Weld neck flange
M2	Shell outlet	Weld neck flange

Dimensional drawing Pharma-line P

Standard units, measurements are approximate

Type	OD	A	B	C
Pharma-line P 1	mm	mm	mm	mm
Pharma-line P 1-0.1	76	1200	180	860
Pharma-line P 1-0.3	89	1200	190	860
Pharma-line P 1-0.4	102	1200	190	860
Pharma-line P 1-0.6	114	1200	200	860
Pharma-line P 1-0.7	140	1200	210	860
Pharma-line P 1-0.8	114	1200	200	860
Pharma-line P 1-1.1	140	1200	210	860
Pharma-line P 1-1.2	168	1200	220	860
Pharma-line S 1-1.9	168	1200	291	860
Pharma-line S 1-2,1	219	1200	310	860
Pharma-line P 1-2.5	219	1200	253	860
Pharma-line P 2				
Pharma-line P 2-0.3	76	2200	180	1860
Pharma-line P 2-0.6	89	2200	190	1860
Pharma-line P 2-1.0	102	2200	190	1860
Pharma-line P 2-1.3	114	2200	200	1860
Pharma-line P 2-1.4	140	2200	210	1860
Pharma-line P 2-1.7	114	2200	200	1860
Pharma-line P 2-2.4	140	2200	210	1860
Pharma-line P 2-2.6	168	2200	220	1860
Pharma-line S 2-4,1	168	2155	291	1860
Pharma-line S 2-4,8	219	2164	310	1860
Pharma-line P 2-5.5	219	2200	253	1860
Pharma-line P 3				
Pharma-line P 3-0.4	73	3200	180	2860
Pharma-line P 3-1.0	89	3200	190	2860
Pharma-line P 3-1.6	102	3200	190	2860
Pharma-line P 3-2.0	114	3200	200	2860
Pharma-line P 3-2.2	140	3200	210	2860
Pharma-line P 3-2.7	114	3200	200	2860
Pharma-line P 3-3.7	140	3200	210	2860
Pharma-line P 3-4.0	168	3200	220	2860
Pharma-line S 3-6,4	168	3155	291	2860
Pharma-line S 3-7,4	219	3164	310	2860
Pharma-line P 3-8.5	219	3200	253	2860



Item	Service	Facing
T1	Tube inlet	Tri-clamp
T2	Tube outlet	Tri-clamp
M1	Shell inlet	Weld neck flange
M2	Shell outlet	Weld neck flange

Alfa Laval Pharma-line S

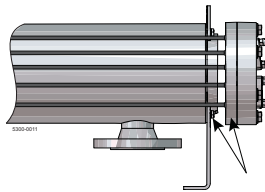
Double tube sheet shell and tube heat exchanger

Applications

The Pharma-line S is used in pharmaceutical water systems; Water For Injection (WFI) and Purified Water (PW) and for heating or cooling of pharmaceutical products.

Working principles

The Pharma-line S is designed in line with ASME BPE, USP and cGMP requirements. In the Pharma-line the risk of mixing between the product and the heating or cooling (service) medium is eliminated as a result of the double tube sheet design. The product flows in the tubes while the service medium flows in a cross flow around the tubes, inside the shell. The service medium is sealed in the shell by the first tube sheet and the second tube sheet seals the product. In the event of a leak, the leakage of either fluid is easily visually detected.



Tube sheets

Fig. 1. Double tube sheets prevent cross contamination between the product and the heating/cooling medium.

Standard range

The Alfa Laval Pharma-line is a high quality double tube sheet shell & tube heat exchanger designed for use in the pharmaceutical and biotechnology industries. It is available in a number of standard sizes and meets the stringent hygiene standard imposed both by control authorities and industry.

The Pharma-line S is available in 21 models, all with U-tube designs that suit most applications.

Within the product range Pharma-line there are 2 series available:

Pharma-line S - Standard design

Pharma-line P - Standard design and a custom design available on request

Installation

The movable legs facilitate flexible positioning. The Pharma-line S can be installed either horizontally or vertically, depending on the specific demands. For an easy installation, lifting lugs are fastened on the units.



Technical data

Heat transfer area	0.1 m ² – 8.5 m ²
Design temperature	-10°C -150°C
Design pressure	FV/10 barg
Pressure vessel codes	PED. Chinese TSG and manufacturing license available
Welding	according to SS-EN-ISO 15614-1, EN 287-1, EN-1418 ASME IX
Surface finish product wetted parts	Mechanically polished with Ra<0.5 µm. and Electropolish with Ra<0.4 µm

Physical data

Product wetted steel parts	316L (seamless tubes)
Gaskets	PTFE (FDA compliance & USP class VI certified)
Connections	NAC plate to connect to tri clamp on tube side and flanges on service side

Options

Insulation Mineral wool (ASTM C795) with stainless steel 304 cladding

Hygienic design

The Pharma-line S has no dead legs and is fully drainable on the product side. All product wetted parts in Pharma-line S are either mechanically or electropolished. The Pharma-line S tubes are seamless and U-tubes are bent to a larger radius than required in ASME BPE. The Pharma-line S is easy to clean and can be steam sterilized. Gaskets come with a USP class VI certificate and are in compliance with FDA.

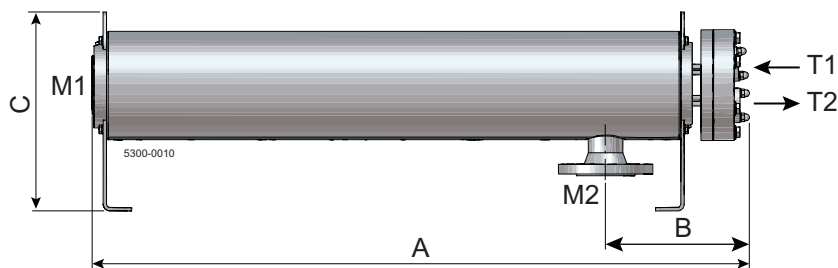
Documentation

The Pharma-line is delivered along with Alfa Laval Q-Doc including:

- Approved drawings and calculations signed by Notified body
- List of welders, welding procedure and welder qualification
- 3.1 Material certificates, pressure and product wetted steel parts
- FDA compliance and USP class VI certificates, gaskets
- Liquid penetrant test report and procedure
- Surface roughness certificate
- Dimension control report
- Pressure test certificate, signed by Notified body
- Identification (technical sign)
- Quality system certificate
- CE-Documents

Standard units, measurements (approximate) [mm]

Type	Shell OD (mm)	Nozzles size		A	B	C
		Tube	flange			
Pharma-line S 1 [mm]						
Pharma-line S 1 - 0.1	76	1"	DN50	1150	225	195
Pharma-line S 1 - 0.3	89	1"	DN50	1150	225	195
Pharma-line S 1 - 0.4	101	1"	DN50	1150	225	195
Pharma-line S 1 - 0.6	114	1 1/2"	DN50	1150	230	195
Pharma-line S 1 - 0.7	141	2"	DN80	1150	260	245
Pharma-line S 1-0.8	114	1 1/2"	DN50	1150	256	347
Pharma-line S 1 - 1.1	141	2"	DN80	1150	260	245
Pharma-line S 1 - 1.2	168	2"	DN80	1150	260	245
Pharma-line S 1-1.9	168	2"	DN80	1155	291	409
Pharma-line S 1-2,1	219	2"	DN125	1165	310	521
Pharma-line S 1-2,5	219	2"	DN150	1165	312	521
Pharma-line S 2 [mm]						
Pharma-line S 2 - 0.3	76	1"	DN50	2150	225	195
Pharma-line S 2 - 0.6	89	1"	DN50	2150	225	195
Pharma-line S 2 - 1.0	101	1"	DN50	2150	225	195
Pharma-line S 2 - 1.3	114	1 1/2"	DN50	2150	230	195
Pharma-line S 2 - 1.4	141	2"	DN80	2150	260	245
Pharma-line S 2-1.7	114	1 1/2"	DN50	2150	256	347
Pharma-line S 2 - 2.4	141	2"	DN80	2150	260	245
Pharma-line S 2 - 2.6	168	2"	DN80	2150	260	245
Pharma-line S 2-4,1	168	2"	DN80	2155	291	409
Pharma-line S 2-4,8	219	2"	DN125	2166	310	521
Pharma-line S 2-5,5	219	3"	DN150	2165	312	521
Pharma-line S 3 [mm]						
Pharma-line S 3 - 0.4	76	1"	DN50	3150	225	195
Pharma-line S 3 - 1.0	89	1"	DN50	3150	225	195
Pharma-line S 3 - 1.6	101	1"	DN50	3150	225	195
Pharma-line S 3 - 2.0	114	1 1/2"	DN50	3150	230	195
Pharma-line S 3 - 2.2	141	2"	DN80	3150	260	245
Pharma-line S 3-2.7	114	1 1/2"	DN50	3150	256	347
Pharma-line S 3 - 3.7	141	2"	DN80	3150	260	245
Pharma-line S 3 - 4.0	168	2"	DN80	3150	260	245
Pharma-line S 3-6,4	168	2"	DN80	3155	291	409
Pharma-line S 3-7,4	219	2"	DN125	3165	310	521
Pharma-line S 3-8,5	219	3"	DN150	3165	310	521



Nozzle schedule

Item	Service	Facing	Standard and dimension
T1	Tube inlet	NAC plate for Tri-clamp	Suitable for ASME BPE
T2	Tube outlet	NAC plate for Tri-clamp	Suitable for ASME BPE
M1	Shell inlet	Weld neck flange	DIN2635/EN1092-1
M2	Shell outlet	Weld neck flange	DIN2635/EN1092-1

