Hexonic | HEAT EXCHANGERS

P-LINE

HEAT EXCHANGERS IN THE PHARMACEUTICAL INDUSTRY

Let's exchange

P-LINE

HEAT EXCHANGERS IN THE PHARMACEUTICAL INDUSTRY

Water is the most commonly used raw material in the pharmaceutical industry. Used not only as the main ingredient in the production of medicines and vaccines, it is also utilized for cleaning technological lines and rinsing of packages.

Water for injection (**WFI**) is produced from purified water that has been treated to eliminate substances harmful to the human body. In the production of medicines, it plays the role of a solvent, substance for dilution of preparations, as well as means for sterilizing containers, equipment or systems.

Generation, storage, and distribution of WFI takes place in carefully designed systems. The required work parameters are usually determined at the design stage and depend on the parameters of the process for which a given medium is used.

Sanitary aspects in the pharmaceutical industry are extremely important. The WFI systems must meet strict hygiene requirements to prevent product contamination. In order to meet these requirements, Hexonic offers specialized P-line heat exchangers that are ideal to be used in WFI generators, storage and distribution systems, and points of use.

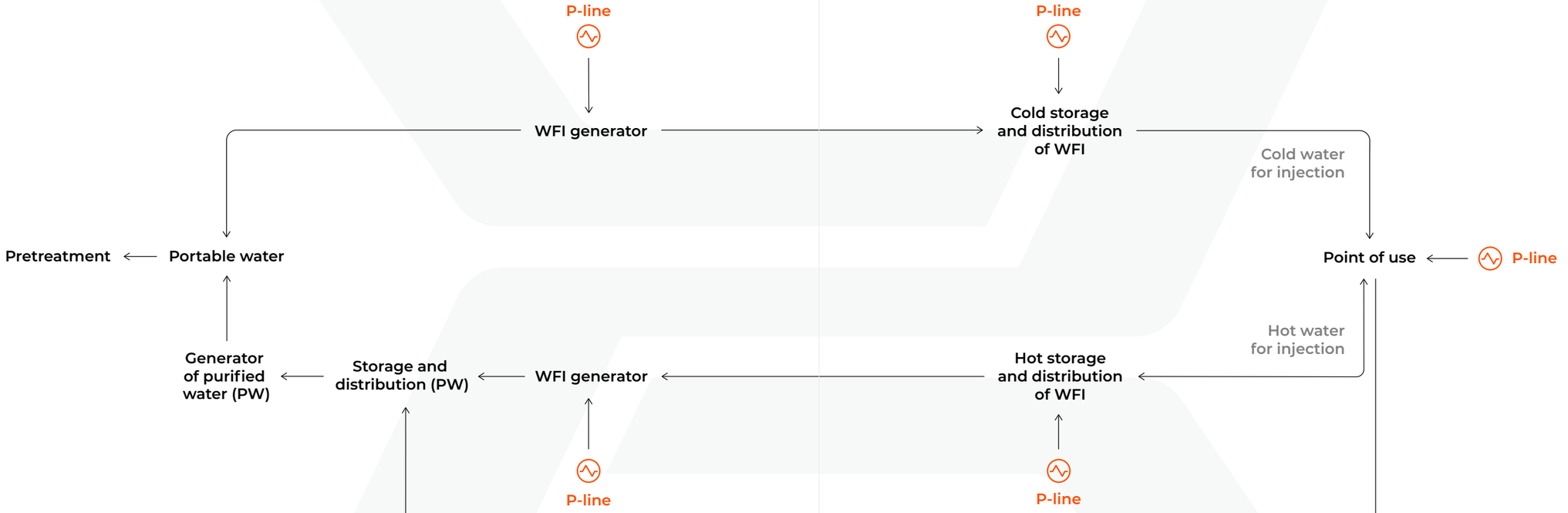


DIAGRAM OF PW AND WFI SYSTEMS WITH P-LINE HEAT EXCHANGERS

WFI — WATER FOR INJECTION

PW — PURIFIED WATER

WFI APPLICATIONS

PRODUCTION OF INJECTABLE MEDICINES

PRODUCTION OF BIOTECHNOLOGICAL PREPARATIONS

PRODUCTION OF HIGH PURITY INHALATION MEDICINES

PRODUCTION OF OPHTHALMIC MEDICINES AND CONTACT LENSES

PRODUCTION OF ADVANCED THERAPY

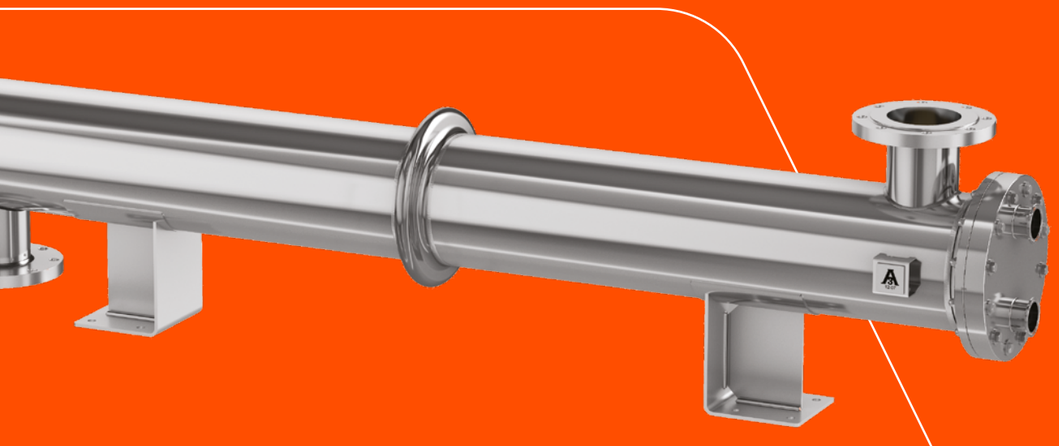
PRODUCTION OF DIAGNOSTIC PREPARATIONS

MEDICINAL PRODUCTS (ATMP): GENE THERAPY PRODUCTS

CLEANING OF CONTAINERS, PACKAGING AND INSTALLATIONS

SOMATIC CELL THERAPY MEDICINAL PRODUCTS

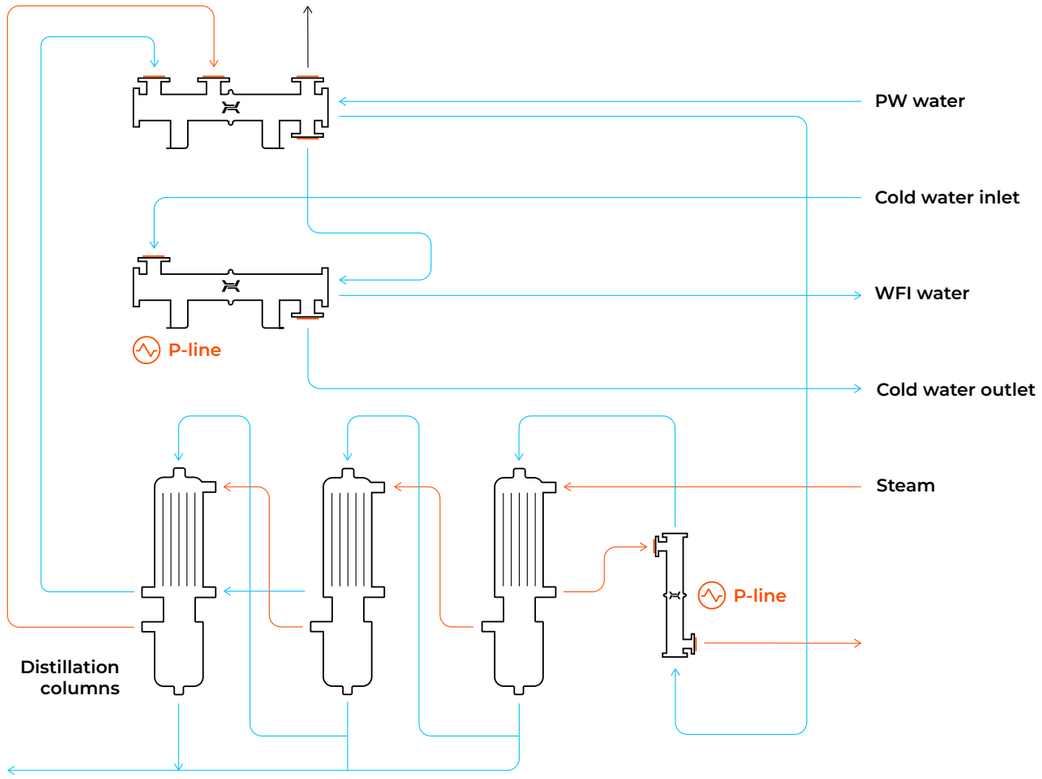
TISSUE ENGINEERING PRODUCTS



HEAT EXCHANGERS IN WFI GENERATORS

Thermal distillation is the most common method used to obtain water for injection (WFI). WFI generator consists of one or more distillation columns in which the process of repeated evaporation and condensation of purified water takes place. As the process is carried out at a high temperature, this method gives complete assurance of the microbiological purity of the WFI water. P-line heat exchangers are used in the WFI generators for preheating, regenerative heating, as well as for final condensation of pure steam and cooling of generated water for injection.

DIAGRAM OF THE WFI GENERATOR WITH P-LINE HEAT EXCHANGERS



WFI — WATER FOR INJECTION

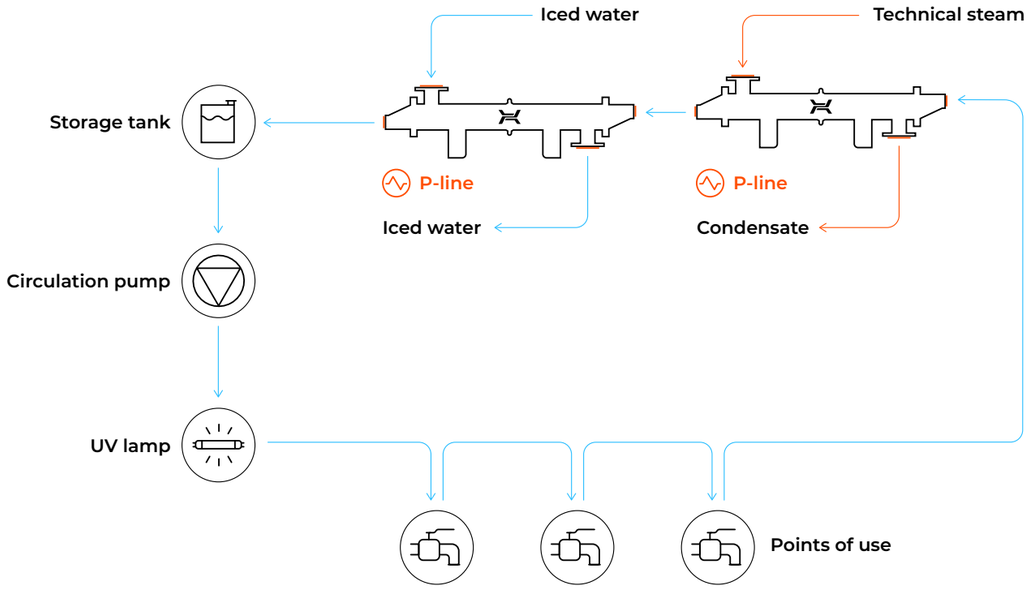
PW — PURIFIED WATER

WFI COLD STORAGE AND DISTRIBUTION SYSTEM

The distilled water generated must be properly stored and distributed to the points of use.

In the cold water storage and distribution system, two P-line heat exchangers are installed. The first one is designed to keep the water temperature low (at 59°F – 86°F) and cool the system. The second heat exchanger periodically heats the WFI water to sterilize the system.

DIAGRAM OF THE WFI COLD WATER STORAGE AND DISTRIBUTION SYSTEM WITH TWO P-LINE HEAT EXCHANGERS INSTALLED



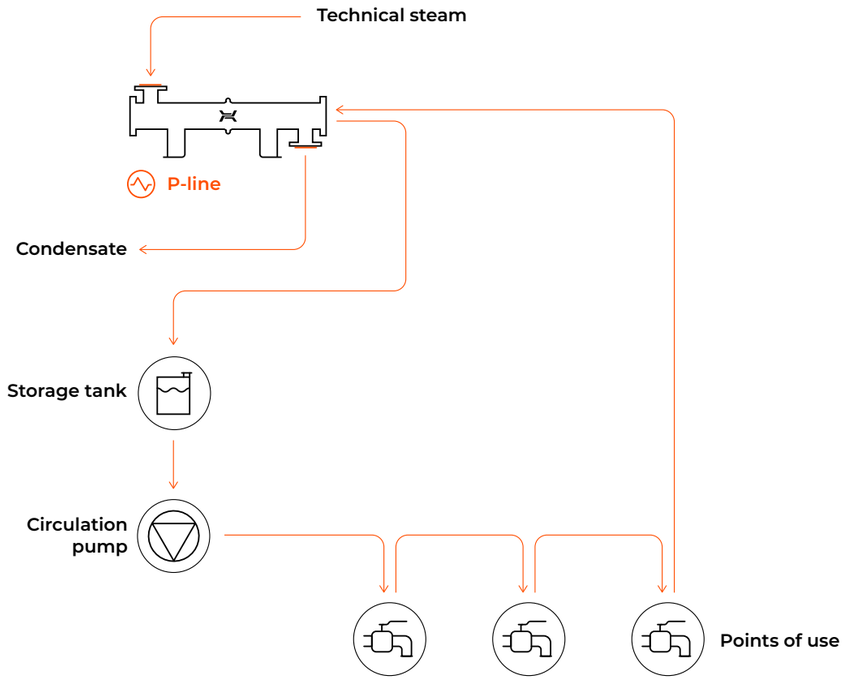
Another option is the system with only one P-line exchanger installed. It then performs both functions. Depending on whether cold water or technical steam flows through the shell, it cools or heats WFI.

WFI HOT STORAGE AND DISTRIBUTION SYSTEM

Another method of storage and distribution is by keeping the water at a constant high temperature of 176°F – 185°F.

The task of the P-line heat exchanger installed in this system is to maintain the temperature using steam or hot water as a working medium.

DIAGRAM OF HOT STORAGE AND DISTRIBUTION SYSTEM WITH A TWO-PASS P-LINE HEAT EXCHANGER INSTALLED

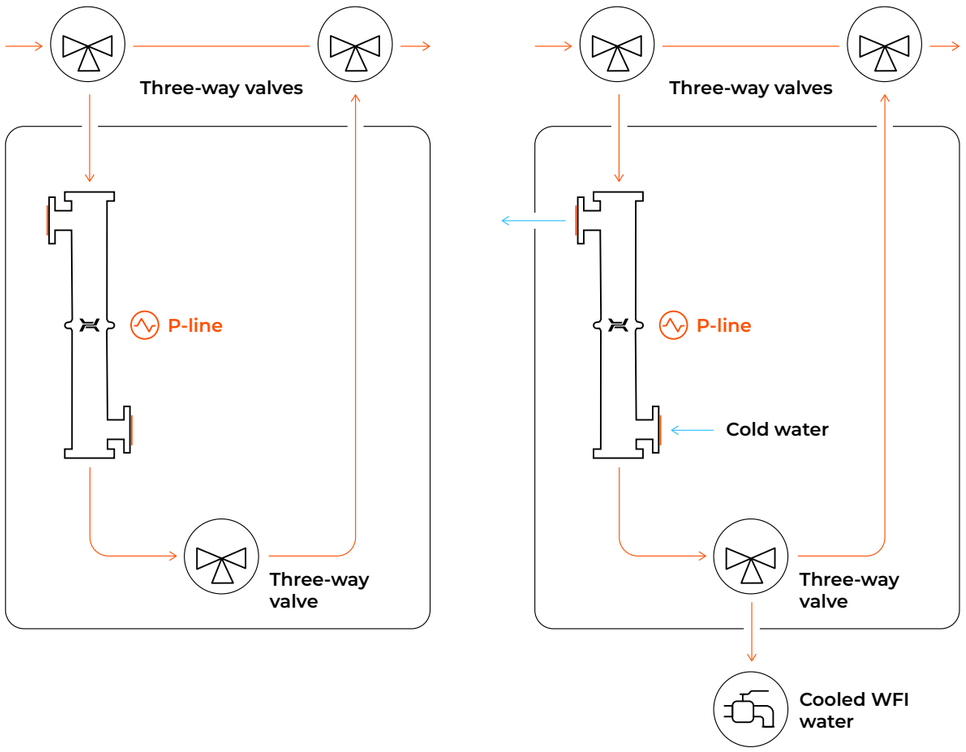


WFI POINTS OF USE

In order to use WFI it must be cooled to the application temperature, which is usually 77°F to 113°F.

If there are many points of use with the same temperature required, an additional circuit may be separated in the system in which the P-line heat exchanger is installed. Its task is to cool the water to the application temperature.

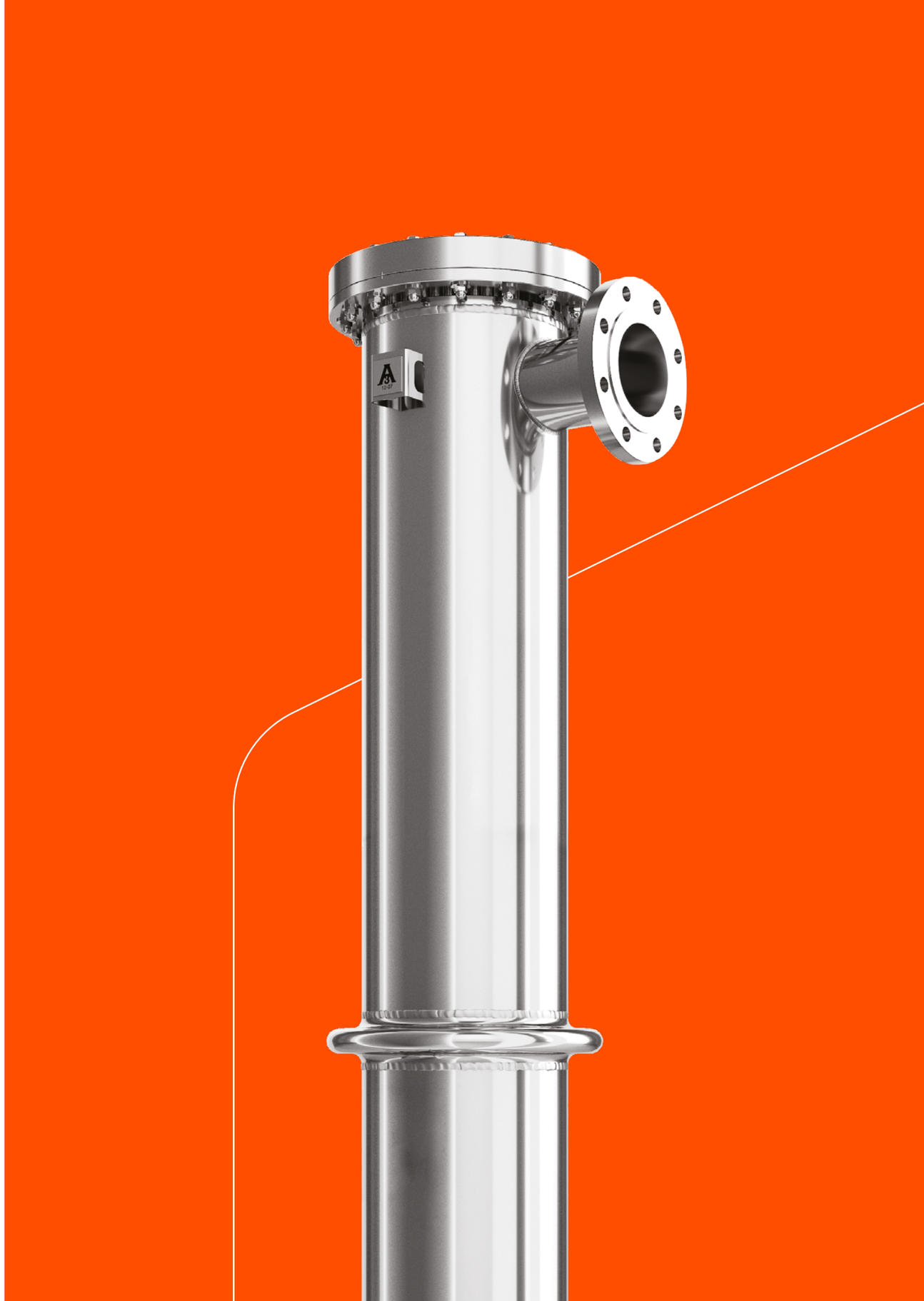
DIAGRAM OF THE POINT OF USE (POU) WITH THE P-LINE EXCHANGER INSTALLED



Another option is to place a heat exchanger just in front of the point of use (POU).

WFI — WATER FOR INJECTION

POU — POINT OF USE



P-LINE

P-line heat exchangers meet the highest requirements of the pharmaceutical industry. At the same time, they meet its stringent hygiene standards imposed by inspection bodies. They have been designed to minimize the risk of contamination and to ensure safe and sterile work.

APPLICATION

PHARMACEUTICAL INDUSTRY

- WFI GENERATOR
- WFI HOT STORAGE AND DISTRIBUTION
- WFI COLD STORAGE AND DISTRIBUTION
- WFI POINT OF USE
- CLEAN STEAM GENERATION

OTHER

- FOOD INDUSTRY
- DAIRY INDUSTRY
- BREWING INDUSTRY

WHY CHOOSE HEXONIC P-LINE HEAT EXCHANGERS?

- DESIGNED TO OPERATE IN PHARMACEUTICAL PRODUCTION
- 3-A CERTIFIED
- MADE ENTIRELY OF STAINLESS STEEL
- ONE-, TWO-, AND FOUR-PASS TYPES
- HORIZONTAL AND VERTICAL MODELS AVAILABLE
- SURFACES THAT COME INTO CONTACT WITH PURE MEDIUM HAVE BEEN POLISHED TO RA ≤ 19.7 µin ROUGHNESS
- MANUFACTURED IN ACCORDANCE WITH CGMP, PED, ASME

P-LINE DESIGN

TUBES ARE CONNECTED WITH TUBESHEETS

using the pressure expansion method with pure pressurized water up to 6000 bar, which eliminates the risk of damaging their inner surface

CORRUGATED TUBE OPTION FOR ENHANCED FLOW TURBULENCE

with a diameter of 0.3 in

DOUBLE TUBESHEET

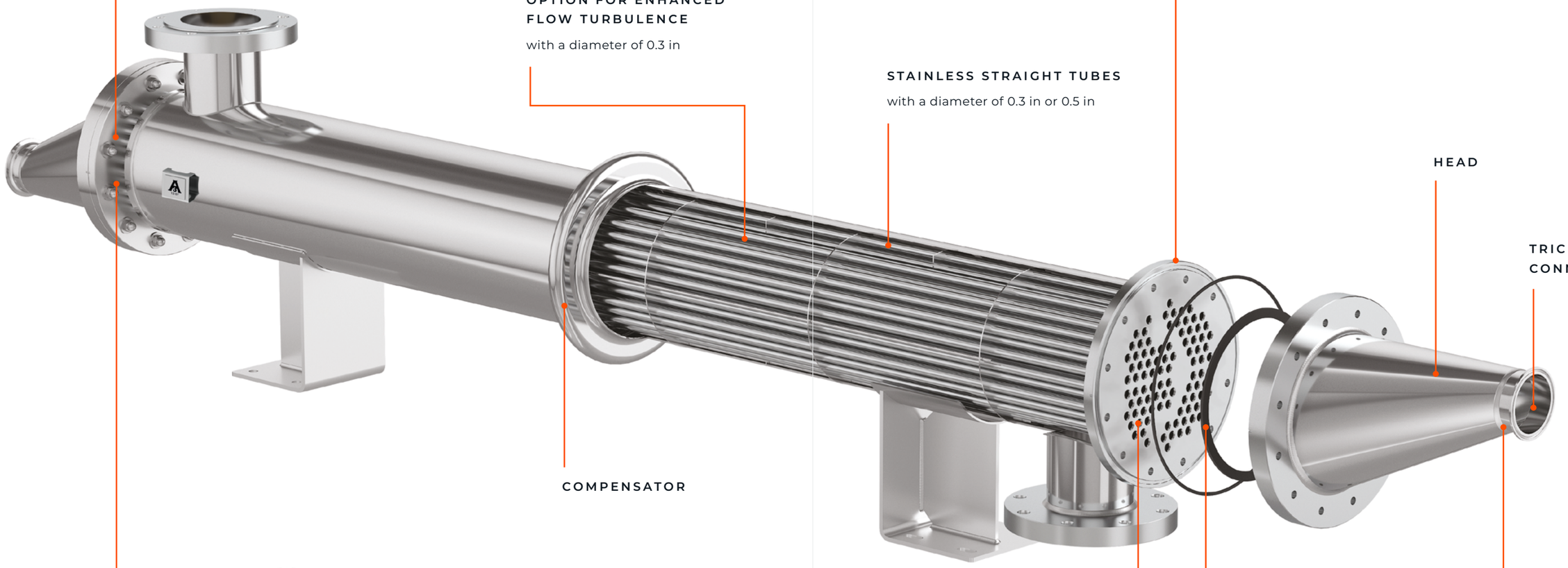
reduces the risk of media mixing in case of potential leakage

STAINLESS STRAIGHT TUBES

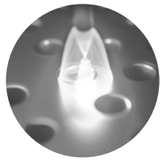
with a diameter of 0.3 in or 0.5 in

HEAD

TRICLAMP CONNECTION



COMPENSATOR



TUBES ARE CONNECTED WITH THE EXTERNAL TUBESHEET

the tubes, expanded using the pressure method, are welded to the external tubesheet using pure argon shield method

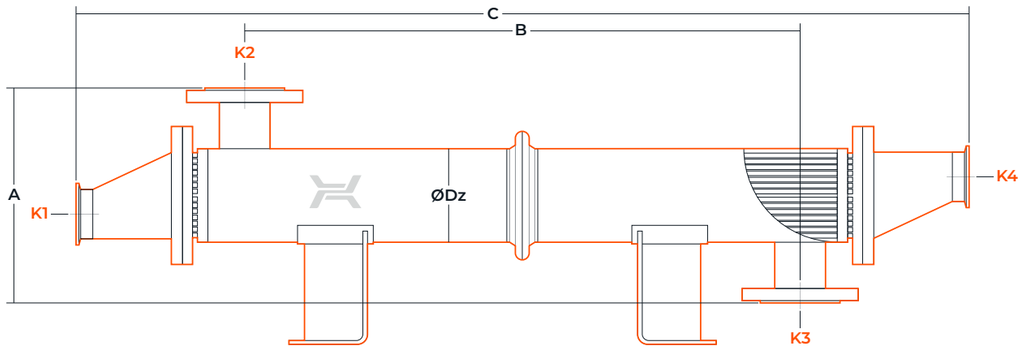
CERTIFIED GASKETS

made of silicone and Viton and clean side Triclamp connections

TECHNICAL DATA

STANDARD LOCATION OF CONNECTIONS:

K1 / K4 — inlet / outlet tube side (hygienic side)
K3 / K2 — inlet / outlet shell side (service side)



EXEMPLARY MEDIA

SHELL SIDE
— WATER
— STEAM
— OTHER

TUBE SIDE
— PHARMACEUTICAL PRODUCT [WATER FOR INJECTION (WFI), PURIFIED WATER]

WORKING PARAMETERS

TUBES
MAX. TEMPERATURE
VITON — 284°F
SILICON — 249°F*

MIN. TEMPERATURE
VITON — 1.4°F*
SILICON — -13°F

MAX. PRESSURE
VITON — 145 PSI
SILICON — 145 PSI

SHELL
MAX. TEMPERATURE — 392°F
MIN. TEMPERATURE — -13°F
MAX. PRESSURE — 145 PSI

* PARAMETERS FOR P-050:
MAX. TEMPERATURE — 284°F
MIN. TEMPERATURE — -13°F

TECHNICAL PARAMETERS

Type	Dimensions A	B	C Type 1P	C Type 2P	C Type 4P	ØDz	Flow types	Tube diameter	Heat exchange area
	in	in	in	in	in	in	–	in	ft²
P-050.070.08	6.9	27.9	34.6	–	–	2.4	1P	0.3	3.5
P-050.110.08	6.9	39.7	46.5	–	–	2.4	1P	0.3	4.9
P-050.140.08	6.9	51.5	58.3	–	–	2.4	1P	0.3	6.2
P-080.070.08	11.8	20.4	39.9	–	–	3.5	1P	0.3	4.9
P-080.110.08	11.8	37.7	57.2	–	–	3.5	1P	0.3	8.2
P-080.140.08	11.8	49.5	69	–	–	3.5	1P	0.3	10.5
P-100.070.08	12.8	20,4	41.8	–	–	4.5	1P	0.3	8.2
P-100.110.08	12.8	37.7	59.2	–	–	4.5	1P	0.3	13.8
P-100.140.08	12.8	49.5	71	–	–	4.5	1P	0.3	17.6
P-125.110.08	13.8	37.7	58,9	50.9	–	5.5	1P, 2P	0.3	21
P-125.140.08	13.8	49.5	70.7	62.8	–	5.5	1P, 2P	0.3	26,8
P-125.190.08	13.8	68	89.2	81.3	–	5.5	1P, 2P	0.3	35.9
P-150.110.08	14.6	37.8	62,1	49.9	–	6.3	1P, 2P	0.3	30.8
P-150.140.08	14.6	49.61	73.9	61.7	–	6.3	1P, 2P	0.3	39.3
P-150.190.08	14.6	68.1	92.4	80.3	–	6.3	1P, 2P	0.3	52.5
P-200.110.08	18.1	36.4	71.6	50.1	50.1	8.6	1P, 2P, 4P	0.3	45.6
P-200.140.08	18.1	48.2	83.4	61.9	61.9	8.6	1P, 2P, 4P	0.3	58
P-200.190.08	18.1	66.7	101.9	80.4	80.4	8.6	1P, 2P, 4P	0.3	77.5
P-250.110.08	21.9	36.5	77.2	51.1	51.1	10.7	1P, 2P, 4P	0.3	84
P-250.140.08	21.9	48.3	89.1	62.9	62.9	10.7	1P, 2P, 4P	0.3	107
P-250.190.08	21.9	66.8	107.6	81.4	81.4	10.7	1P, 2P, 4P	0.3	143
P-050.070.12	6.9	27.9	34.6	–	–	2.4	1P	0.5	2
P-050.110.12	6.9	39.7	46.5	–	–	2.4	1P	0.5	2.8
P-050.140.12	6.9	51.5	58.3	–	–	2.4	1P	0.5	3.6
P-080.070.12	11.8	20.4	39.9	–	–	3.5	1P	0.5	4.6
P-080.110.12	11.8	37.7	57.2	–	–	3.5	1P	0.5	7.7
P-080.140.12	11.8	49.5	69	–	–	3.5	1P	0.5	9.8
P-100.070.12	12.8	20.4	69	–	–	4.5	1P	0.5	6.3
P-100.110.12	12.8	37.7	59.2	–	–	4.5	1P	0.5	10.5
P-100.140.12	12.8	49.5	71	–	–	4.5	1P	0.5	13.4
P-125.110.12	13.8	37.7	58.9	50.9	–	5.5	1P, 2P	0.5	17.8
P-125.140.12	13.8	49.5	70.7	62.8	–	5.5	1P, 2P	0.5	22.7
P-125.190.12	13.8	68	89.2	81.3	–	5.5	1P, 2P	0.5	30.3
P-150.110.12	14.57	37.8	62.1	49.9	–	6.3	1P, 2P	0.5	21.8
P-150.140.12	14.57	49.6	73.9	61.7	–	6.3	1P, 2P	0.5	27.9
P-150.190.12	14.57	68.1	92.4	80.3	–	6.3	1P, 2P	0.5	37.3
P-200.110.12	18.11	36.4	71.6	50.1	50.1	8.6	1P, 2P, 4P	0.5	39.2
P-200.140.12	18.11	48.2	83.4	61.9	61.9	8.6	1P, 2P, 4P	0.5	49.9
P-200.190.12	18.11	66.7	101.9	80.4	80.4	8.6	1P, 2P, 4P	0.5	66.6
P-250.110.12	2.8	36.5	77.2	51.1	51.1	10.7	1P, 2P, 4P	0.5	73.2
P-250.140.12	21.8	48.3	89.1	62.9	62.9	10.7	1P, 2P, 4P	0.5	93.2
P-250.190.12	21.8	66.8	107.6	81.4	81.4	10.7	1P, 2P, 4P	0.5	124.6

H – horizontal | V – vertical | 1P – single-pass | 2P – two-pass | 4P – four-pass

All dimensions and technical data are approximate only and may be changed without further notice.

Type	Weight			Tube side capacity			Shell side capacity
	Type 1P	Type 2P	Type 4P	Type 1P	Type 2P	Type 4P	
	lb	lb	lb	gal	gal	gal	gal
P-050.070.08	22.1	–	–	0.1	–	–	0.3
P-050.110.08	26.4	–	–	0.2	–	–	0.4
P-050.140.08	30.7	–	–	0.2	–	–	0.6
P-080.070.08	68.5	–	–	0.4	–	–	0.8
P-080.110.08	79.0	–	–	0.5	–	–	1.2
P-080.140.08	86.2	–	–	0.6	–	–	1.5
P-100.070.08	70.9	–	–	0.6	–	–	1.3
P-100.110.08	86.7	–	–	0.9	–	–	2.1
P-100.140.08	97.4	–	–	1.0	–	–	2.6
P-125.110.08	128.1	141.8	–	1.4	0.8	–	3.0
P-125.140.08	143.0	156.8	–	1.6	1.0	–	3.8
P-125.190.08	168.3	182.0	–	1.9	1.3	–	5.0
P-150.110.08	194.4	210.7	–	2.0	1.2	–	7.5
P-150.140.08	211.9	228.2	–	2.3	1.5	–	7.9
P-150.190.08	252.3	268.6	–	2.8	1.9	–	9.8
P-200.110.08	298.2	310.7	311.6	4.2	1.8	1.8	8.0
P-200.140.08	336.4	348.9	349.8	4.6	2.2	2.2	10.0
P-200.190.08	396.3	408.8	409.7	5.2	2.8	2.8	13.2
P-250.110.08	414.9	475.2	461.4	8.4	3.5	3.5	11.7
P-250.140.08	472.3	532.5	518.8	9.1	4.3	4.2	14.8
P-250.190.08	562.3	622.5	608.8	10.2	5.4	5.3	19.5
P-050.070.12	22.0	–	–	0.1	–	–	0.3
P-050.110.12	26.2	–	–	0.2	–	–	0.5
P-050.140.12	30.3	–	–	0.2	–	–	0.6
P-080.070.12	72.5	–	–	0.5	–	–	0.6
P-080.110.12	86.0	–	–	0.6	–	–	1.0
P-080.140.12	95.1	–	–	0.7	–	–	1.2
P-100.070.12	74.1	–	–	0.7	–	–	1.2
P-100.110.12	92.1	–	–	0.9	–	–	1.9
P-100.140.12	104.4	–	–	1.1	–	–	2.4
P-125.110.12	141.0	154.7	–	1.6	1.1	–	2.6
P-125.140.12	159.6	173.3	–	1.8	1.3	–	3.3
P-125.190.12	191.4	205.1	–	2.3	1.7	–	4.3
P-150.110.12	201.9	218.2	–	2.1	1.3	–	7.3
P-150.140.12	221.8	238.1	–	2.4	1.6	–	7.5
P-150.190.12	266.3	282.7	–	3.0	2.1	–	9.3
P-200.110.12	327.3	339.8	340.7	4.7	2.4	2.4	6.9
P-200.140.12	373.9	386.3	387.2	5.3	2.9	2.9	8.7
P-200.190.12	446.8	459.2	460.1	6.1	3.7	3.7	11.5
P-250.110.12	470.7	530.9	517.2	9.4	4.6	4.5	9.7
P-250.140.12	544.3	604.5	590.8	10.4	5.6	5.5	12.3
P-250.190.12	659.7	719.9	706.1	11.9	7.1	7.0	16.3

* Weight for the horizontal exchanger model.

H – horizontal | V – vertical | 1P – single-pass | 2P – two-pass | 4P – four-pass

All dimensions and technical data are approximate only and may be changed without further notice.

Type	Type and material of connections	Connection size		
		Type 1P	Type 2P	Type 4P
P-050.070.08	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	1", 3"	–	–
P-050.110.08	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	1", 3"	–	–
P-050.140.08	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	1", 3"	–	–
P-080.070.08	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	3/2", 3/2"	–	–
P-080.110.08	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	3/2", 3/2"	–	–
P-080.140.08	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	3/2", 3/2"	–	–
P-100.070.08	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	2", 2"	–	–
P-100.110.08	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	2", 2"	–	–
P-100.140.08	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	2", 2"	–	–
P-125.110.08	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	2", 3"	2", 2"	–
P-125.140.08	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	2", 3"	2", 2"	–
P-125.190.08	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	2", 3"	2", 2"	–
P-150.110.08	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	3", 3"	3", 2"	–
P-150.140.08	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	3", 3"	3", 2"	–
P-150.190.08	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	3", 3"	3", 2"	–
P-200.110.08	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	4", 3"	4", 2"	4", 2"
P-200.140.08	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	4", 3"	4", 2"	4", 2"
P-200.190.08	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	4", 3"	4", 2"	4", 2"
P-250.110.08	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	4", 4"	4", 3"	4", 2"
P-250.140.08	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	4", 4"	4", 3"	4", 2"
P-250.190.08	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	4", 4"	4", 3"	4", 2"
P-050.070.12	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	1", 3"	–	–
P-050.110.12	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	1", 3"	–	–
P-050.140.12	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	1", 3"	–	–
P-080.070.12	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	3/2", 3/2"	–	–
P-080.110.12	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	3/2", 3/2"	–	–
P-080.140.12	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	3/2", 3/2"	–	–
P-100.070.12	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	2", 2"	–	–
P-100.110.12	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	2", 2"	–	–
P-100.140.12	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	2", 2"	–	–
P-125.110.12	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	2", 3"	2", 2"	–
P-125.140.12	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	2", 3"	2", 2"	–
P-125.190.12	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	2", 3"	2", 2"	–
P-150.110.12	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	3", 3"	3", 2"	–
P-150.140.12	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	3", 3"	3", 2"	–
P-150.190.12	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	3", 3"	3", 2"	–
P-200.110.12	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	4", 3"	4", 2"	4", 2"
P-200.140.12	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	4", 3"	4", 2"	4", 2"
P-200.190.12	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	4", 3"	4", 2"	4", 2"
P-250.110.12	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	4", 4"	4", 3"	4", 2"
P-250.140.12	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	4", 4"	4", 3"	4", 2"
P-250.190.12	FLANGE ASME B16.5 #150 SORF, TRI-CLAMP ASME BPE Type B, SS	4", 4"	4", 3"	4", 2"

* Weight for the horizontal exchanger model.

H – horizontal | V – vertical | 1P – single-pass | 2P – two-pass | 4P – four-pass

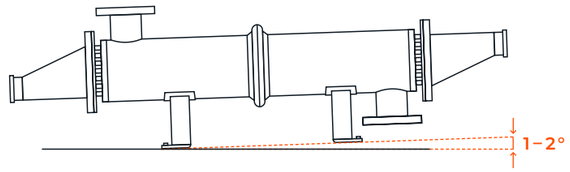
All dimensions and technical data are approximate only and may be changed without further notice.

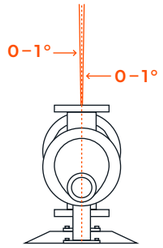
MOUNTING

P-line heat exchangers can be installed vertically or horizontally depending on the application and available space.

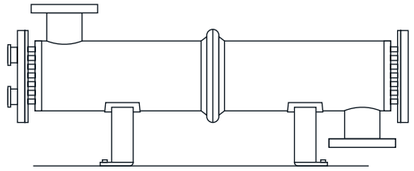
HORIZONTAL MOUNTING

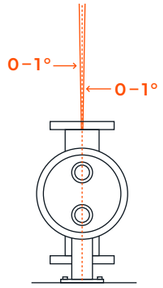
1P HEAT EXCHANGER





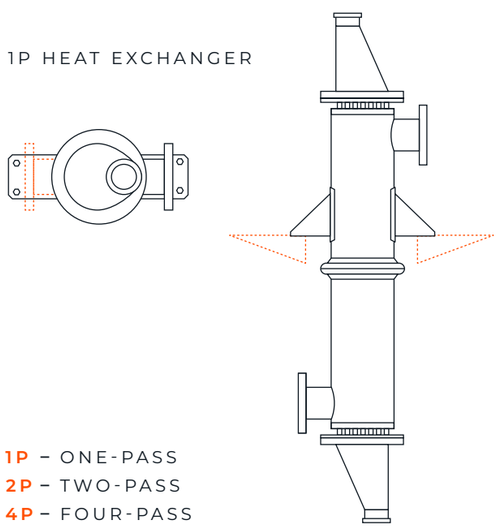
2P AND 4P HEAT EXCHANGER





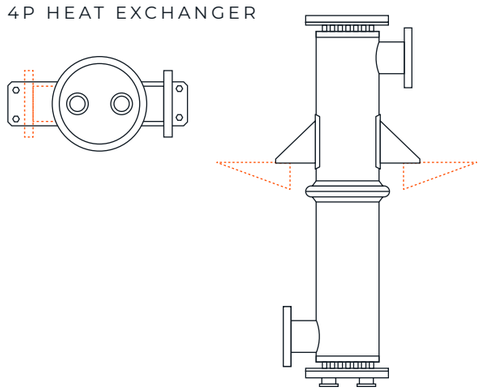
VERTICAL MOUNTING

1P HEAT EXCHANGER

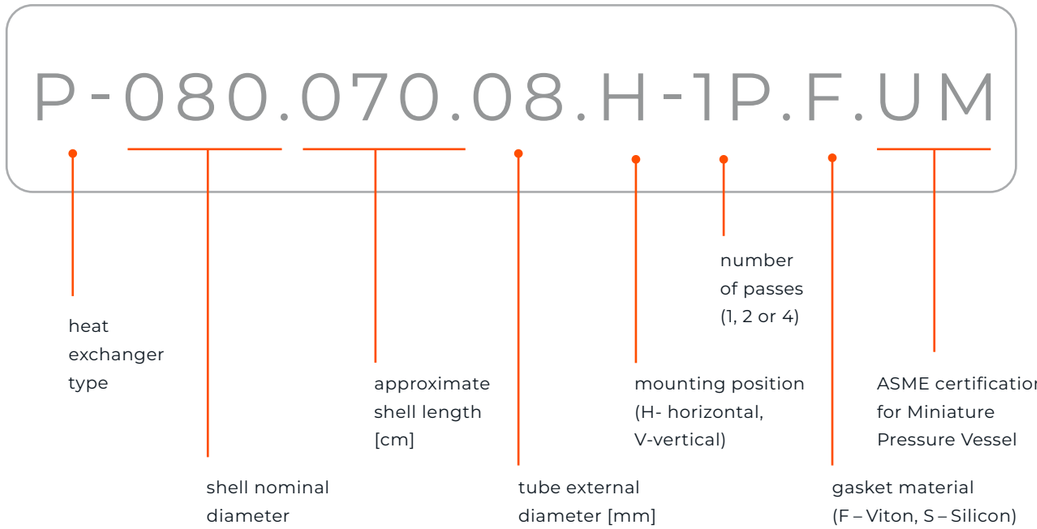


1P – ONE-PASS
2P – TWO-PASS
4P – FOUR-PASS

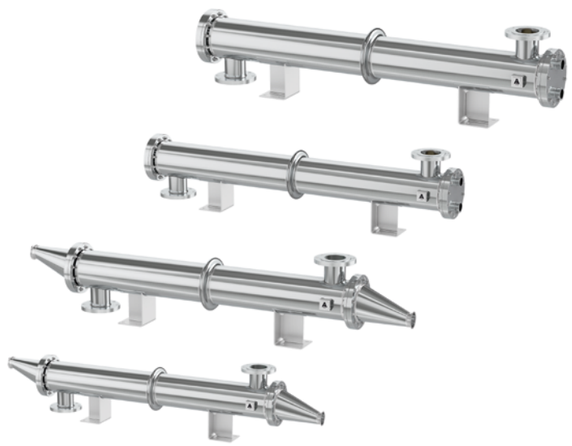
2P HEAT EXCHANGER
4P HEAT EXCHANGER

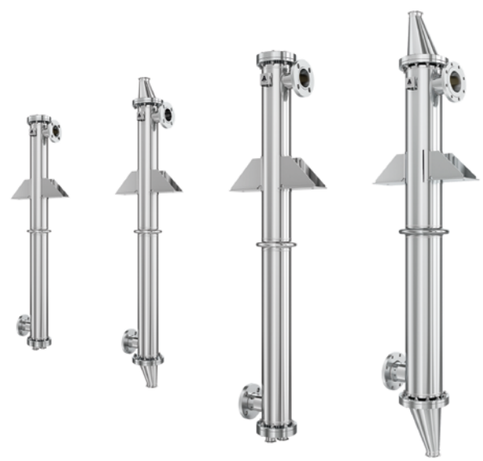


EXEMPLAR DESIGNATION



PRODUCT LINE





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