TI-P222-03
TES Issue 6

VEP and VES
Turflow Heat Exchangers

Description

The Turflow heat exchanger range is a shell & tube design consisting of straight corrugated tubes within a shell. The tubes are secured at either end of the shell by fixed tube sheets.
The corrugated tube design promotes increased turbulent flow conditions to provide the Turflow's high heat transfer efficiency. The shell incorporates a bellows type expansion joint that ensures thermal stress does not damage the heat exchanger. The shell is also fitted with drain and vent connections. The heat exchanger is a gasket free design constructed wholly from stainless steel.
Normally the heated fluid will flow through the tubes and the heating medium will be in the shell; both countercurrent and concurrent flow paths can be accommodated, inclusive of horizontal or vertical installation.

Standards

Turflow type heat exchangers fully comply with the requirements of the EU Pressure Equipment Directive/UK Pressure Equipment (Safety) Regulations and carry the CE mark when so required.

All units are supplied with a Declaration of Conformity.

Turflow type heat exchangers fully comply with the requirements of the ASME Boiler and Pressure Vessel Code and carry the "U" ASME Stamp when so required.

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Certification

A manufacturer's Hydraulic Test Report and Material Certification documentation is available on request.
Note: All certification /inspection requirements must be stated at the time of order placement.

EN	ASME	GB National standard
CE mark with PED EU Pressure Equipment Directive/UK Pressure Equipment (Safety) Regulations EC1935/2004 compliant tube side	ASME VIII design with U stamp certification	Chinese GB national standard

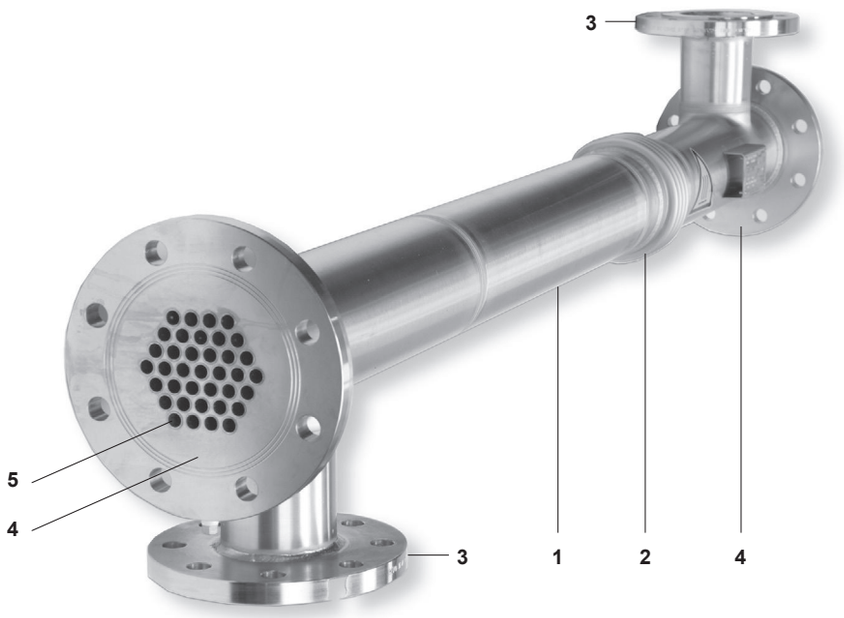
Pressure/temperature limits

			DIN	ASME
PMA Shell/Tube side	-10 °C to 200 °C		12 bar g (176 psi g)	12 bar g (176 psi g)
	200 °C to 300 °C		6 bar g (87 psi g)	6 bar g (87 psi g)
	This option is to be specified at the time of order placement.			
TMA Shell/Tube side	12 bar g	-10 °C to 200 °C (14 °F to 392 °F)		-10 °C to 200 °C (14 °F to 392 °F)
	6 bar g	200 °C to 300 °C (392 °F to 572 °F)		200 °C to 300 °C (392 °F to 572 °F)
	This option is to be specified at the time of order placement.			
Cold hydraulic test pressure			21 bar g with design limit to 12 bar g (304.5 psi g with design limit to 174 psi g)	17.1 bar g with design limit to 12 bar g (241 psi g) with design limit to 174 psi g)
			10.5 bar g with design limit to 6 bar g (152.2 psi g with design limit to 87 psi g)	8.55 bar g with design limit to 12 bar g (124 psi g with design limit to 174 psi g)

Turflow type heat exchangers

The **VEP** design is fitted with small diameter tubes.
The **VES** design is fitted with large diameter tubes.
Please contact Spirax Sarco for advice regarding selection – The most suitable unit will be selected by Spirax Sarco and will be specific for the given application.

Materials



No.	Part		Material		Surface finish
1	Shell		Stainless steel	ASTM A312 – TP304	Pickling
2	Expansion joint		Stainless steel	ASTM A240 – TP321	Pickling
3	Shell side flanges		Stainless steel	ASTM A182 F304	Pickling
4	Tube sheets/tube side flanges (Different options available according to the specific model)	SX	Stainless steel 316	ASTM A182 F316	Pickling
		SS	Stainless steel 304	ASTM A182 F304	
5	Corrugated tubes (Different options available according to the specific model)	SX	Stainless steel 316	ASTM A249-TP316L	Pickling *
		SS	Stainless steel 304	ASTM A249-TP304	

*** Note** "FB" version will undergo tube side passivation internal tube in addition to specified treatments.

Sizes and end connections

Type	Shell length (metres)	Shell Ø	Connections
VEP	0.6, 1, 1.5 and 2 *	1½", 2", 3" 4", 5", 6", 8" and 10"	Flanged EN 1092 PN16 or ASME B16.5 Class 150
VES	1, 2 and 3	2", 3" 4", 5", 6", 8" and 10"	Flanged EN 1092 PN16 or ASME B16.5 Class 150

*** Note** 0.6 and 1.5 shell lengths are not available for shell diameters 5" to 10".

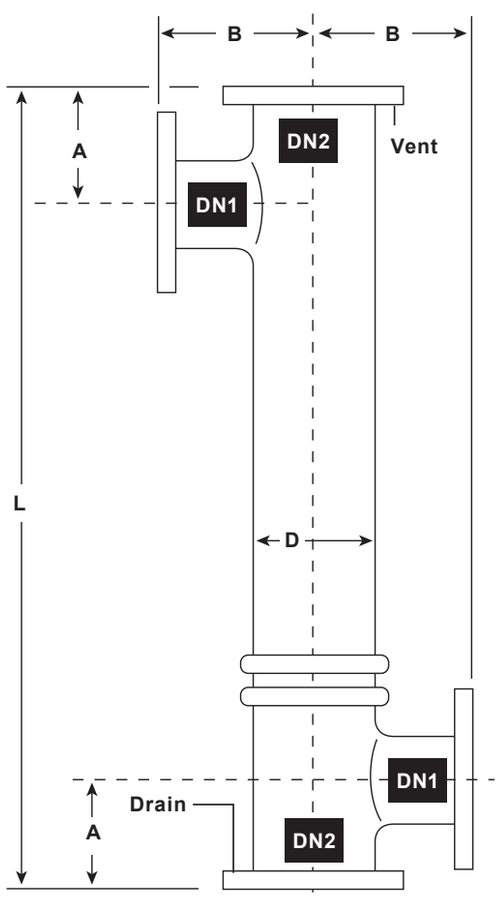
Dimension for shell size 1½" and 2" (approximate) in mm (inches)

Weight in Kg (Lbs) and Volume in Ltr (gal)

							VEP				VES			
Shell	Flange		Dimensions				Weight	Volume		PED Cat.	Weight	Volume		PED Cat.
Ø	DN1	DN2	A	B	D	L		Tube	Shell			Tube	Shell	
1½"	DN32 (1¼")	DN40 (1½")	94 (3½")	140 (5½")	48.3 (2")	600 (23½")	11.2 (24.5)	0.21 (0.05)	0.84 (0.22)	SEP	-	-	-	-
						1000 (39½")	12.4 (27.3)	0.35 (0.09)	1.28 (0.33)	SEP	-	-	-	-
						1500 (59")	14 (30.8)	0.53 (0.14)	1.85 (0.48)	SEP	-	-	-	-
						2000 (78¾")	15.5 (34)	0.71 (0.18)	2.42 (0.64)	SEP	-	-	-	-
2"	DN40 (1½")	DN50 (2")	90 (3½")	140 (5½")	60.3 (2¼")	600 (23½")	13.9 (30.6)	0.46 (1.12)	1.18 (0.31)	SEP	-	-	-	-
						1000 (39½")	15.8 (34.8)	0.76 (0.20)	1.81 (0.47)	SEP	15 (33)	0.85 (0.22)	1.86 (0.49)	SEP
						1500 (59")	18.2 (40)	1.15 (0.30)	2.59 (0.68)	SEP	-	-	-	-
						2000 (78¾")	20.5 (45)	1.53 (0.40)	3.88 (1.02)	SEP	19 (42)	1.69 (0.44)	3.42 (0.90)	SEP
						3000 (118")	-	-	-	-	22.9 (50)	2.54 (0.67)	4.98 (1.31)	I

Table notes:

- Dimension tolerance:
  A = ± 3 mm,
  B = ± 3 mm,
  L = ± 6 mm,
  Flange rotation = ± 1°,
  Connection alignment = ± 3 mm.
- Flange sizes according to EN 1092-1 rating PN16, optional equivalent diameter according to ASME B16.5 rating 150 lb.
- PED categorisation Group 2 according to the classification as per the EU Pressure Equipment Directive/UK Pressure Equipment (Safety) Regulations.



Dimension for shell size 3" and 4" (approximate) in mm (inches)

Weight in Kg (Lbs) and Volume in Ltr (gal)

							VEP				VES			
Shell	Flange		Dimensions				Weight	Volume		PED Cat.	Weight	Volume		PED Cat.
Ø	DN1	DN2	A	B	D	L		Tube	Shell			Tube	Shell	
3"	DN65 (2½")	DN80 (3")	110 (4¼")	160 (6¼")	88.9 (3½")	600 (23½")	19.7 (43)	1.07 (0.5)	2.63 (0.7)	SEP	-	-	-	-
						1000 (39½")	22.5 (49)	1.79 (0.4)	3.95 (1)	SEP	23.9 (53)	2.0 (0.52)	4.3 (1.1)	I
						1500 (59")	25.9 (57)	2.67 (0.7)	5.63 (1.5)	I	-	-	-	-
						2000 (78¾")	29.3 (65)	3.57 (0.9)	7.24 (1.9)	I	32.1 (70)	3.9 (1)	7.7 (2)	I
						3000 (118")	-	-	-	-	40.3 (88)	5.9 (1.55)	11.1 (2.93)	I
4"	DN80 (3")	DN100 (4")	125 (5")	180 (7")	114.3 (4½")	600 (23½")	28.3 (62)	1.88 (0.5)	4.15 (1.1)	SEP	-	-	-	-
						1000 (39½")	35.3 (78)	3.14 (0.8)	6.25 (1.6)	I	32.3 (70)	3.7 (0.98)	6.4 (1.7)	I
						1500 (59")	44.1 (97)	4.71 (1.2)	8.88 (2.4)	I	-	-	-	-
						2000 (78¾")	52.8 (116)	6.28 (1.6)	10.5 (2.7)	I	46.9 (103)	7.4 (1.9)	11.4 (3)	I
						3000 (118")	-	-	-	-	61.5 (135)	11.1 (2.93)	16.4 (4.3)	I

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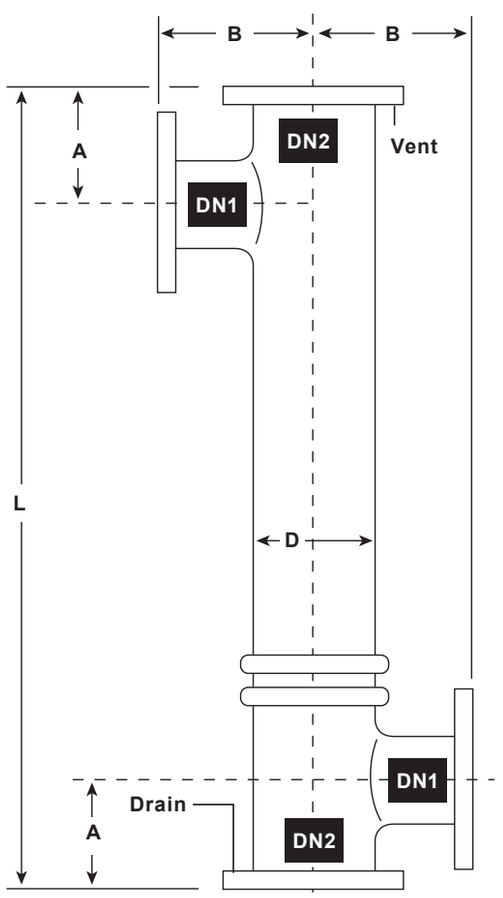
Table notes:

- Dimension tolerance:
  A = ± 3 mm,
  B = ± 3 mm,
  L = ± 6 mm,
  Flange rotation = ± 1°,
  Connection alignment = ± 3 mm.
- Flange sizes according to EN 1092-1 rating PN16, optional equivalent diameter according to ASME B16.5 rating 150 lb.
- PED categorisation Group 2 according to the classification as per the EU Pressure Equipment Directive/UK Pressure Equipment (Safety) Regulations.



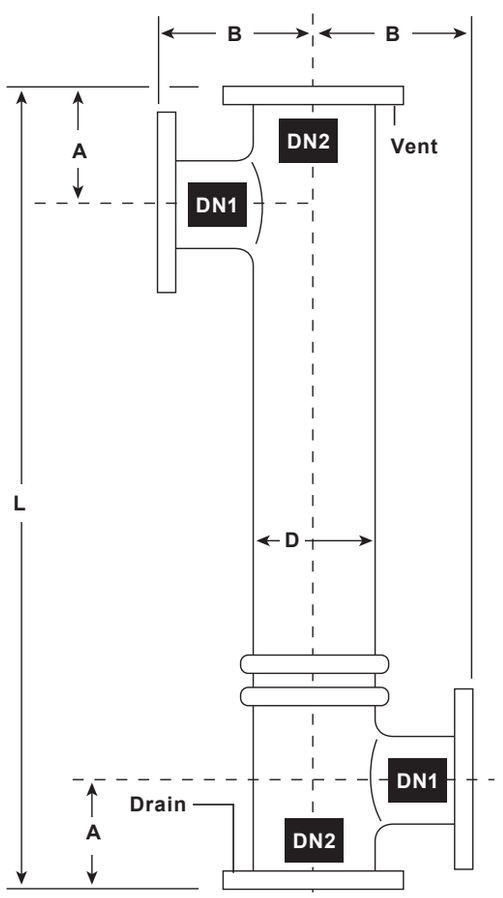
Dimension for shell size 5" and 6" (approximate) in mm (inches)

Weight in Kg (Lbs) and Volume in Ltr (gal)

							VEP				VES			
Shell	Flange		Dimensions				Weight	Volume		PED Cat.	Weight	Volume		PED Cat.
Ø	DN1	DN2	A	B	D	L		Tube	Shell			Tube	Shell	
5"	DN80 (3")	DN125 (5")	125 (5")	200 (8")	141.3 (5½")	1000 (39½")	49 (108)	5.18 (1.3)	8.5 (2.2)	I	43.7 (96)	5.9 (1.5)	9.0 (2.3)	I
						2000 (78¾")	77.6 (171)	10.36 (2.7)	16.07 (4.2)	I	67 (147)	11.7 (3)	16.6 (4.3)	I
						3000 (118")	-	-	-	-	90.3 (198)	17.6 (4.6)	24.2 (6.4)	II
6"	DN100 (4")	DN150 (6")	140 (5½")	220 (8½")	168.3 (6½")	1000 (39½")	67.7 (149)	7.73 (2)	11.88 (3)	I	58.7 (127)	8.1 (2)	13.4 (3.5)	I
						2000 (78¾")	106.9 (236)	15.45 (4)	22.06 (5.8)	II	88.6 (194)	16.1 (4)	24.5 (6.5)	II
						3000 (118")	-	-	-	-	118.5 (260)	24.1 (6.3)	35.6 (9.4)	II

Table notes:

- Dimension tolerance:
  A = ± 3 mm,
  B = ± 3 mm,
  L = ± 6 mm,
  Flange rotation = ± 1°,
  Connection alignment = ± 3 mm.
- Flange sizes according to EN 1092-1 rating PN16, optional equivalent diameter according to ASME B16.5 rating 150 lb.
- PED categorisation Group 2 according to the classification as per the EU Pressure Equipment Directive/UK Pressure Equipment (Safety) Regulations.



Dimension for shell size 8 and 10" (approximate) in mm (inches)

Weight in Kg (Lbs) and Volume in Ltr (gal)

							VEP				VES			
Shell	Flange		Dimensions				Weight	Volume		PED Cat.	Weight	Volume		PED Cat.
Ø	DN1	DN2	A	B	D	L		Tube	Shell			Tube	Shell	
8"	DN125 (5")	DN200 (8")	160 (6¼")	250 (10")	219.1 (8½")	1000 (39½")	103.3 (227)	12.7 (3.3)	18.74 (5)	II	86 (189)	13.3 (3.4)	23.2 (6)	II
						2000 (78¾")	168.9 (372)	25.6 (6.6)	35.5 (9.3)	II	132 (291)	26.5 (7)	42.8 (11.3)	II
						3000 (118")	-	-	-	-	178.4 (392)	39.7 (10.5)	62.5 (16.5)	II
10"	DN150 (6")	DN250 (10")	180 (7")	280 (11")	273.0 (10¾")	1000 (39½")	171 (377)	20.2 (5.2)	29.1 (7.6)	II	142.2 (313)	19.3 (5.1)	35.6 (9.4)	II
						2000 (78¾")	270.5 (595)	40.5 (10.5)	55 (14.5)	II	209.5 (461)	38.5 (10)	67.5 (17.8)	II
						3000 (118")	-	-	-	-	276.7 (608)	57.7 (15.2)	99.3 (26.2)	III

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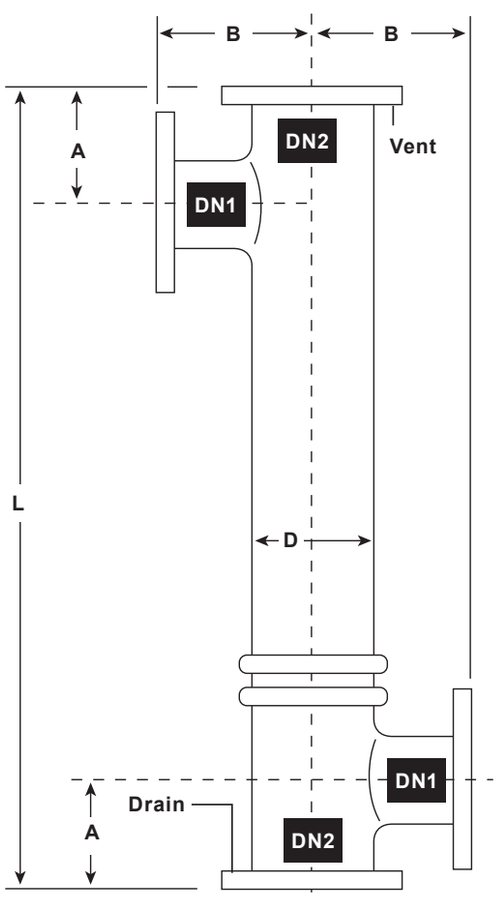
Table notes:

- Dimension tolerance:
  A = ± 3 mm,
  B = ± 3 mm,
  L = ± 6 mm,
  Flange rotation = ± 1°,
  Connection alignment = ± 3 mm.
- Flange sizes according to EN 1092-1 rating PN16, optional equivalent diameter according to ASME B16.5 rating 150 lb.
- PED categorisation Group 2 according to the classification as per the EU Pressure Equipment Directive/UK Pressure Equipment (Safety) Regulations.



Product nomenclature

Turflow type	VEP	=	Small diameter tubes	**VES**
	VES	=	Large diameter tubes	
Shell diameter	1½", 2", 3", 4", 5", 6", 8" and 10"	=	VEP range in inches	**2"**
	2", 3", 4", 5", 6", 8" and 10"	=	VES range in inches	
Tube and tube sheet material	SS	=	Stainless steel AISI 304	**SX**
	SX	=	Stainless steel AISI 316L	
Tube length	0.6 , 1, 1.5, 2	=	VEP range in metres	**3**
	1, 2, 3	=	VES range in metres	
Connections type	F	=	UNI 2278/2229 PN16 flanges **(*) (**)**	**FE**
	FE	=	EN1092-1 PN16 flanges **(**)**	
	FA	=	ASME B16.5 Class 150 flanges **(^)**	
Mechanical code	Empty	=	VSR **(*) (**)**	**E**
	E	=	EN13445 **(**)**	
	A	=	ASME VIII Div.1 **(*) (^)**	
Shell design pressure	V	=	12 bar	**V**
	Empty	=	Other **(*)**	
Tube to tube sheet coupling	Empty	=	Expanding **(^)**	**S**
	S	=	Welding	
Certifications	Empty	=	None	
	FB	=	EC 1935 certificate (tube side) **(**)**	
PED category (not relevant for ASME version)	Empty	=	CE marking not supplied	**CI**
	CI	=	Category I	
	CII	=	Category II	
	CIII	=	Category III	

(*) = Option not standard for EN version – available on request
(**) = Option not standard for ASME version – available on request
(^) = Not available for "FB" version

Product selection example	**VES**	**2"**	**SX**	**3**	**FE**	**E**	**V**	**S**		**CI**

How to order

Contact your local Spirax Sarco office with your application details - We will provide the correct product selection, and quotation for the Turflow exchanger that will provide optimum performance for your application.

TI-P222-02
TES Issue 6

Turflow Type Heat Exchanger EVC (Exhaust Vapour Condenser)

Description

The Spirax Sarco EVC is based on the Turflow heat exchanger with an additional connection and utilises flash steam from discharge and exhaust vent pipework to pre-heat make-up or process water thereby recovering valuable heat energy that would otherwise be lost to atmosphere.
The Spirax Sarco EVC will improve steam system efficiency and is environmentally friendly, reducing CO^2 + carbon emissions and removing visible discharges from the atmosphere whilst saving valuable energy. It is easy to install and provides an optimised heat transfer solution when compared to other heat exchanger designs used in similar applications.
As standard the construction is completely stainless steel and the tube side is all in AISI 316. There are no gaskets (with the exception of the piping connection) and no painted components.
The heat-exchanging surface is of straight corrugated tubes designed for low viscosity fluids and for turbulent flow working conditions.
The tube sheets are of an integral type and are supplied ready for installation.

Standards

Designed and manufactured in accordance with EN 13445 code and fully complies with the requirements of the Pressure Equipment Directive (PED).
Turflow type heat exchangers fully comply with the requirements of the ASME Boiler and Pressure Vessel Code and carry the "U" ASME Stamp when so required.

Certification

This product is available with a manufacturers Typical Test Report.
Note: All certification/inspection requirements must be stated at the time of order placement.

EN	ASME	GB National standard
CE mark with Pressure Equipment Directive (PED)	ASME VIII design with U stamp certification	Chinese GB national standard

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Heat transfer solutions

Heat exchangers

Available models

Heat exchanger	Steam mass flow		Heat load		Water flow	
	kg/h	(lb/h)	kW	(MBtu/h)	kg/h	(Gal/m)
EVC 1½" - 1F	30	(66)	19	(0.06)	804	(3.5)
EVC 2" - 1F	50	(110)	31	(0.1)	1 350	(6)
EVC 3" - 1F	75	(165)	47	(0.16)	2 020	(9)
EVC 3" - 1F	100	(220)	62	(0.2)	2 690	(11.8)
EVC 4" - 1F	200	(440)	125	(0.42)	5 370	(23.5)
EVC 6" - 1F	300	(660)	187	(0.6)	8 060	(35.5)
EVC 8" - 1F	500	(1 102)	312	(1.06)	13 400	(59)
EVC 10" - 1F	750	(1 653)	469	(1.6)	20 100	(88.5)

* Performance sized with water from 50 °C to 70 °C (122 °F to 158 °F).
** Sized with maximum inlet steam velocity 15 m/s (49 ft/s).

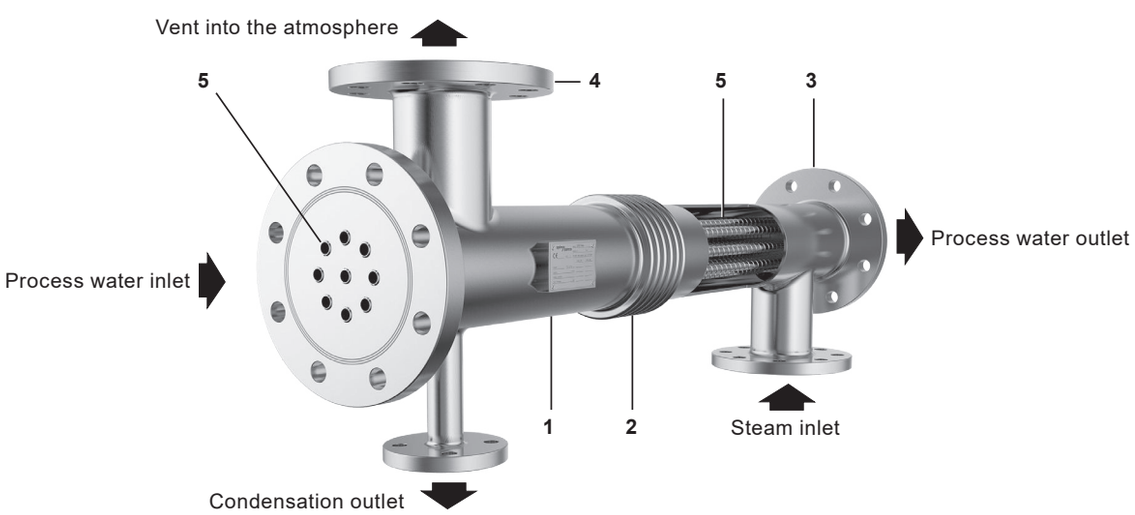
Pressure/temperature limits

TMA	Maximum allowable temperature	Shell side	6 bar g (87 psi g)	300 °C (572 °F)
		Tube side	12 bar g (174 psi g)	200 °C (392 °F)
PMA	Maximum allowable pressure	Shell side	-10 °C to +200 °C (14 °F to 392 °F)	12 bar g (174 psi g)
		Tube side		

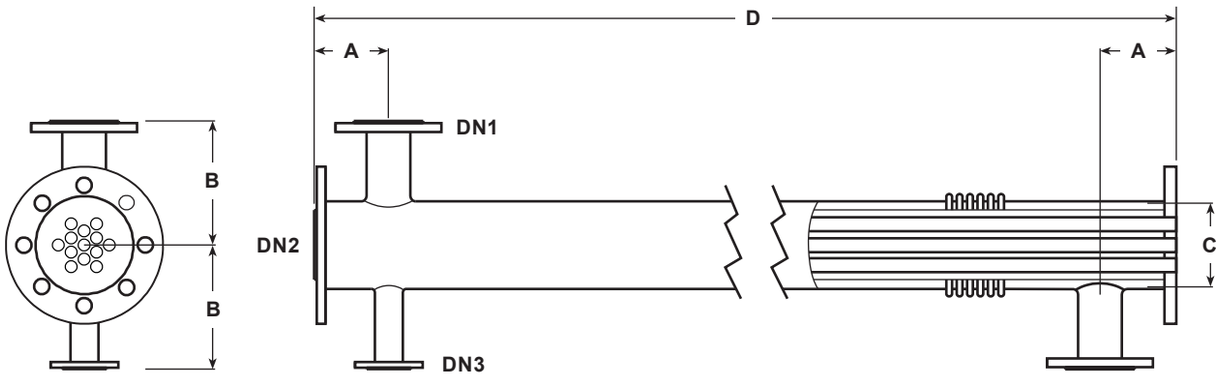
The cold hydraulic tests are performed at 21 bar g with design limit to 12 bar g (304.5 psi g with design limit to 174 psi g) and at 10.5 bar g with design limit to 6 bar g (152.2 psi g with design limit to 87 psi g). This pressure meets with the requirements of Section 7.4, attachment 1, of the Pressure Equipment Directive (PED).

Materials

No.	Part	Material	ASTM designation
1	Shell	Stainless steel	A312 TP304
2	Expansion joint	Stainless steel	A240 TP321
3	Tubesheet	Stainless steel	A182 F316
4	Shell side connections	Stainless steel	A182 F304
5	Tubes (corrugated)	Stainless steel	A249 TP316



Dimensions/weights (approximate) in mm and kg (inches and lbs)



Model	DN1	DN2	DN3	A	B	C	D	Weight
EVC 1½" - 1F	32 (1¼")	40 (1½")	15 (½")	94 (3¾")	140 (5½")	48.3 (2")	1000 (39¼")	13.2 (29)
EVC 2" - 1F	40 (1½")	50 (2")	15 (½")	90 (3½")	140 (5½")	60.3 (2¼")	1000 (39¼")	16.5 (36)
EVC 3" - 1F	65 (2½")	80 (3")	15 (½")	110 (4¼")	160 (6¼")	88.9 (3½")	1000 (39¼")	23.0 (50)
EVC 4" - 1F	80 (3")	100 (4")	25 (1")	125 (5")	180 (7")	114.3 (4½")	1000 (39¼")	36.4 (80)
EVC 6" - 1F	100 (4")	150 (6")	25 (1")	140 (5½")	220 (8½")	168.3 (6½")	1000 (39¼")	68.2 (138)
EVC 8"- 1F	125 (5")	200 (8")	32 (1¼")	160 (6¼")	250 (9¾")	219.1 (8½")	1000 (39¼")	106.0 (233)
EVC 10" - 1F	150 (6")	250 (10")	40 (1½")	180 (7")	280 (11")	273.0 (10¾")	1000 (39¼")	145.0 (319)

Table notes:

- **Dimension tolerance:**
  A = ± 3 mm,
  B = ± 3 mm,
  D = ± 6 mm,
  Flange rotation = ± 1°,
  Connection alignment = ± 3 mm.
- Flange sizes according to EN 1092-1 rating PN16, optional equivalent diameter according to ASME B16.5 rating 150 lb.
- PED categorisation assuming a 'not dangerous fluid', Group 2 according to the classification as per the Pressure Equipment Directive (PED).

Safety information, installation and maintenance

For full details see the Installation and Maintenance Instructions supplied with the product.

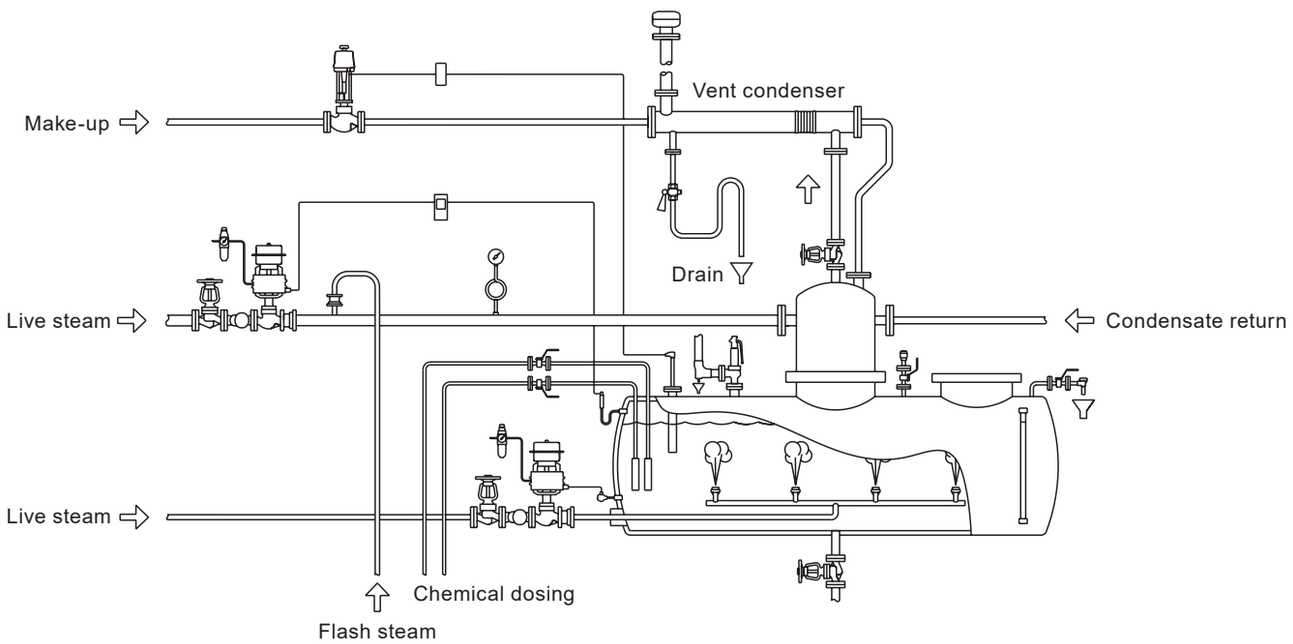
Installation note:

The installation depends on the application and on the service required; however **the unit must always be installed horizontally**.
It is always necessary that one end of the heat exchanger is allowed to move axially, in order to permit the normal expansion of the exchangers tubes during operation.
We recommend that an air vent be fitted to the unit to continuously vent during start-up and operation.
Insulation is recommended, and it is absolutely necessary, if the shell temperature is much higher than the ambient one - If insulation is required it is suggested that it be fitted on site to eradicate its damage whilst in transit.

Disposal

This product is recyclable. No ecological hazard is anticipated with the disposal of this product providing due care is taken.

Typical installation



Sizing and selection

Spirax Sarco has developed integrated thermal modelling, sizing and selection software, to select and fully optimise an EVC heat exchanger to precisely match your application needs. Trained technicians are available at your local Spirax Sarco company to ensure the correct heat exchanger is always selected. Because of Spirax Sarco's expertise and wide product range we can provide a complete heat transfer solution, advising on the most suitable control system and ancillary equipment for your heat exchanger.
Our technicians can also advise on the suitability and sizing of heat exchangers for most gases, vapours and superheated liquids other than water.

EVC product nomenclature:

Please note that other units are available on request to suit the specifics of a particular process application.

Turflow type	EVC = Large diameter tubes		EVC
Shell diameter	1½", 2", 3", 4", 6", 8", 10" = Range in inches		3"
Tube and tubesheet material	SX = Stainless steel AISI 316		SX
Tube length	1 m (39") = Range in meter		1
Connection type	F = UNI 2278/2229 PN16 flanges		FE
	FA = ANSI B16.5 Class 150 Flanges		
	FE = EN1092-1 PN16 flanges		
Mechanical code	Empty = VSR		E
	E = EN13445		
	A = ASME VIII Div.1		
Shell design pressure	V = 12 bar g (174 psi g)		V
Tube to tube sheet coupling	Empty = Expanding		
PED category	Empty = CE marking not supplied		CI
	CI = Category I		
	CII = Category II		

Product selection example	EVC	3"	SX	1	FE	E	V		CI

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