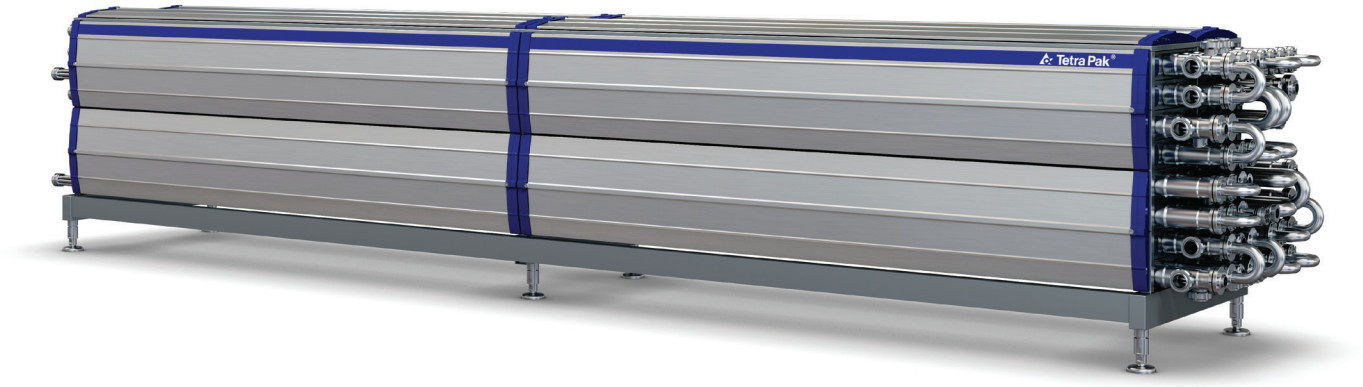
Tetra Pak® Tubular Heat Exchanger C



Application

General heating and cooling duties, heat recovery, pasteurization and UHT treatment of a broad range of food products.

Highlights

- Floating Protection System
- Inspectable
- Energy efficient
- Modular frame

Working principle

The Tetra Pak® Tubular Heat Exchanger C is a single-pass shell-and-tube heat exchanger. The product flows through one or more straight inner tubes with the medium (or product) flowing counter-current between and/or around.

The inner tubes are normally corrugated for increased turbulence and heat transfer efficiency.

Smooth inner tubes are available for special applications, e.g. high-viscosity products.

Some tube module types (CDR, CMR and CMRF) are designed for product-to-product heat recovery. In these, the processed product flows through a bundle of parallel inner tubes and the unprocessed product flows between and around these, enabling unique energy saving opportunities.

The CC tube module consists of three concentric channels. The product flows in the middle channel and the media in the surrounding channels.

Tube modules are normally connected in series and grouped on a common frame. Each frame can contain several such sections, as well as additional equipment (holding tubes, protective panels and insulation).

Product portfolio

Tetra Pak® Tubular Heat Exchanger C comprises a family of the following single-pass shell-and-tube heat exchangers:

CD & CHD	Double tube for multi-purpose thermal treatment of particulate products. (CHD = high-pressure version)
CDR	Double tube for product-to-product heat recovery of low-viscosity products.
CM & CHM	Multitube for thermal treatment of most liquid products. (CHM = high-pressure version)
CMR & CHMR	Multitube for product-to-product heat recovery of low-viscosity products. (CHMR = high-pressure version)
CMRF	Multitube for product-to-product heat recovery of low-viscosity products with pulp and fibres.
CMP	Multitube for products with a very high pulp or fibre content.
CC	Concentric tubes for processing viscous and particulate food products.

Standard design

The heat transfer surface consists of one or more straight inner tubes welded into a tube case at each end. O-rings seal the tube cases from the shell connections, and the shell connections from the shell – creating a system that allows movement between the different parts as well as between individual tube modules. The tube modules rest on shell supports which also allows movement.

This design – the Floating Protection System – eliminates thermal stress by allowing parts to expand and contract naturally as the metal heats up or cools down. Moreover, it enables tube modules to easily be disassembled for inspection and allows replacement of individual parts. This ensures food safety, shortens downtime and lowers the total cost of ownership.

The fully modular design enables each unit to be tailored to your needs. Standardized interfaces between parts simplifies expansion and/or reconfiguration to changed processing needs. Multiple heat exchangers (with different tube insert types, configurations, shell sizes, etc) can be combined in a common frame.

Normally, internal tube dividers are used to keep inner tubes apart and in place. In the CMRF model, a spring box attached at one end of the tube module replaces these. The encased spring counters the gravitational pull by stretching the inner tubes, resulting in a free product flow. This enables efficient product-to-product heat recovery also for fibrous products (fibre length up to 15 mm).

The standard tube module length is 6 metres.

Material

Product-wetted surfaces in pressure-vessel steel, 1.4404 (AISI 316L). Other parts in 1.4307 (AISI 304L). Product seals in EPDM.

Design temperature

Design temperature: 180 °C (356 °F) or 160 °C (320 °F), depending on tube module type.

Approval

The tube modules are designed in accordance with PED (European Pressure Equipment Directive) for the pressure ranges and temperatures specified in the table on the opposite page. MHLW and CRN available on request.

Key to type designations

$$\underset{a}{\text{CMR}}\ \underset{b}{85}\ /\ \underset{c}{12}\ \text{x}\ \underset{d}{16}\ \underset{e}{\text{C}}\ -\ \underset{f}{6}$$

a Model designation E.g. CMR = Multitube, regenerative execution

b Outer diameter of shell in mm

c Number of inner tubes
For CC modules: N = Normal or W = Wide channel gap

d Outer diameter of inner tube(s) in mm

e C = corrugated inner tube(s), S = smooth inner tube(s), Q = new corrugation

f Tube module length in m (3 or 6)

Options

Materials

- Most tube inserts and bends can be supplied in 1.4547 (254 SMO)
- Shell in grade 1.4404 (AISI 316L)

Seals

- Product seals in PTFE
- O-rings in Fluoroprene

Accessories

- Base frame
- Fully welded frame
- Holding tubes, horizontal or sloping design, single or double, in lengths adapted to the flow and holding time. Several holding tubes can be connected in series.
- Protective panels (compulsory for high-temperature and high-pressure applications)

Design

3 m tube module lengths (except for CMRF and CC)

Insulation

Customizable system with wrapping of temperature zones, heat exchanger unit and/or holding tube bends.

Approval

PED certification or other pressure-vessel codes (availability varies by model and country)

Commissioning

Kit with tools (for maintenance) and extra seals (for tube inserts and product flanges)

Optional certification

- EHEDG (available for a range of CM modules)
- 3-A (available for CD, CHD, CM, CHM, CMP, CMR, CMRF and CDR)

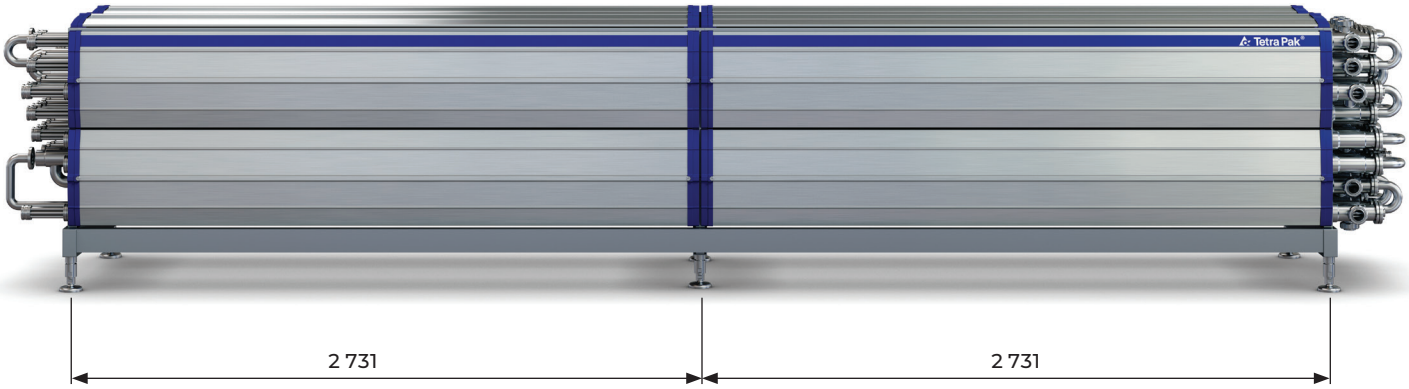
Design pressure

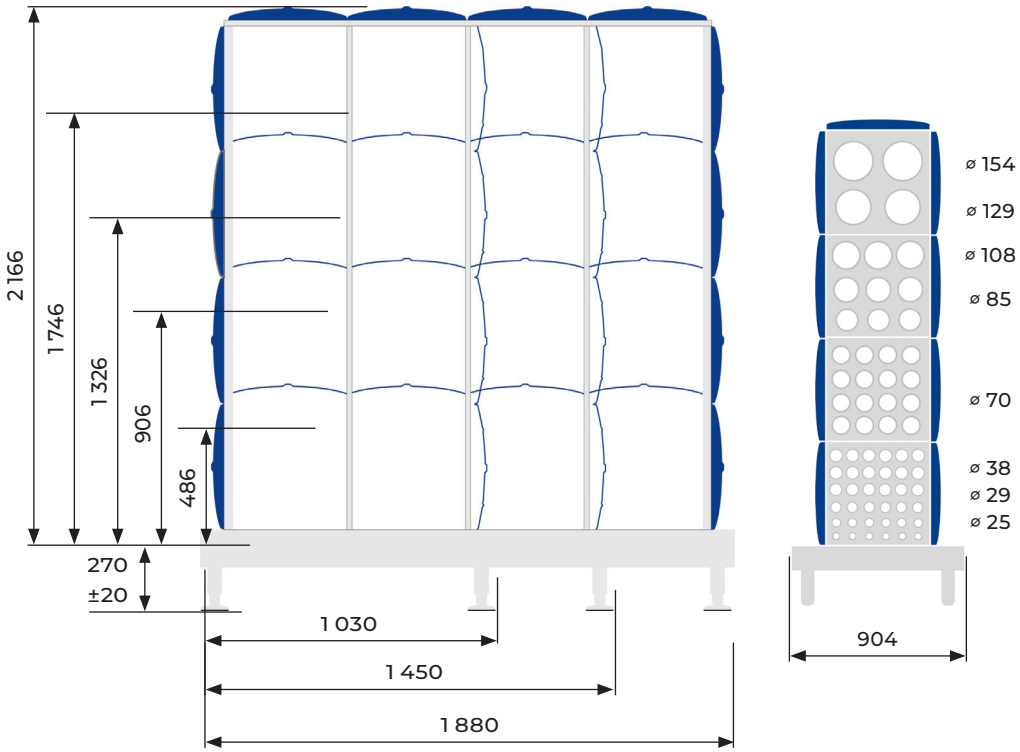
Model											Design pressure*	
Shell diameter (mm)	CD	CHD	CDR	CM	CHM	CMR	CHMR	CMRF	CMP	CC	Shell (MPa)	Tube (MPa)
25	▪										2	8
29	▪										2	8
38	▪		▪								2	8
70	▪			▪		▪		▪			2	5
		▪			▪		▪				2	8
85	▪			▪		▪		▪	▪		1.6	4
					▪		▪				1.6	6
108		▪		▪		▪			▪		2.0	4
					▪		▪				2.0	6
								▪			1.6	4
										▪	1.6	5
129	▪			▪		▪		▪	▪		1	2.5
		▪			▪		▪				1	4
154	▪			▪		▪			▪		1	2.5
		▪			▪		▪				1	3.2

* Valid for the standard design at 180 °C or 160 °C (25–38 mm shell diameters, CMRF and CC models and high-pressure versions).
For Tetra Pak® Tubular Heat Exchanger CC “shell” refers to media side and “tube” refers to product side.

Dimensions

Measurements in mm



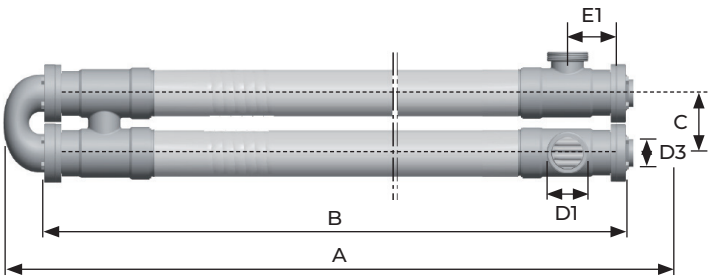


Tube modules with different shell diameters can be mounted on the same frame.

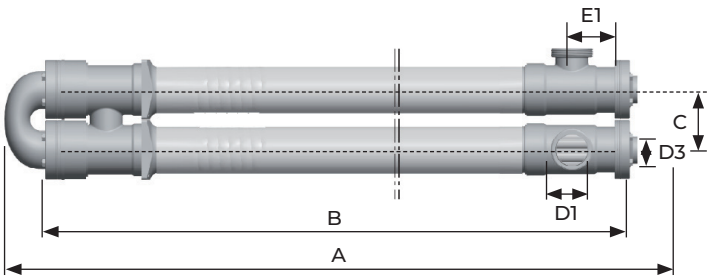
The picture shows the number of tube modules, per shell diameter, that can be mounted in the space covered by one protective panel.

Tetra Pak® Tubular Heat Exchanger

(all models except cc)



Models CD, CHD, CDR, CM, CHM, CMR, CHMR and CMP

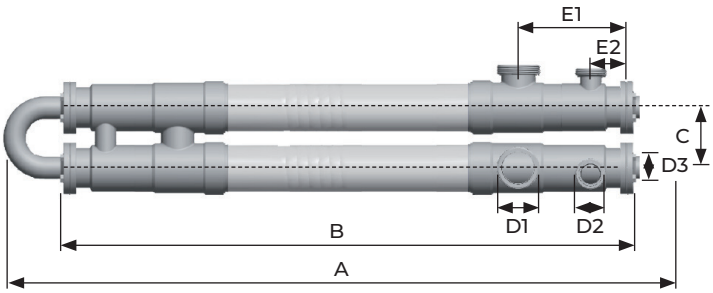


Models CMRF

	C25	C29	C38	C70	C85	C108	C129	C154
Size	6 m / 3 m	6 m / 3 m	6 m / 3 m	6 m / 3 m	6 m / 3 m	6 m / 3 m	6 m / 3 m	6 m / 3 m
A	5,862 / 2,891	5,862 / 2,891	5,862 / 2,891	6,190 / 3,220	6,249 / 3,279	6,267 / 3,297	6,364 / 3,394	6,382 / 3,412
B	5,736 / 2,765	5,736 / 2,765	5,736 / 2,765	5,986 / 3,016	5,998 / 3,028	6,004 / 3,034	6,008 / 3,038	6,008 / 3,038
C	70	70	70	105	140	140	210	210
D1	25	25	25	51	76	76	104	104
D3	12 x 0.8	16 x 0.8	16 x 0,8 20 x 1.0, 25 x 1.2	38 x 1.5	51 x 1.5	63.5 x 1.6	76 x 1.6	104 x 2
E1	60	60	60	103	118	118	118	118

A = max. length bend to bend **B** = max. length counterflange to counterflange **C** = center to center **D1** = SMS **D3** = flange with welding end **E1** = center SMS to split ring

Tetra Pak® Tubular Heat Exchanger CC



Size	CC108
A	6,507
B	6,256
C	140
D1	76
D2	51
D3	51 x 1.5
E1	253

A = max. length bend to bend
B = max. length counterflange to counterflange
C = center to center
D1 = SMS
D2 = SMS
D3 = flange with welding end
E1 = center SMS to split ring
E2 = center SMS to split ring

Product channel gap

N (normal gap): 6 mm
W (wide gap): 14 mm

Information required for quotation

To assure an accurate quotation on the most suitable unit, order enquiries should include:

- Required flow rates
- Temperature programme
- Physical properties of product and media
- Desired working pressure
- Maximum acceptable pressure drop

Environment

Utility consumption and heat recovery are optimized for each specific case. The exact amount of energy consumed depends on the duty the specific heat exchanger performs. In pasteurization duties, it is possible to utilize product-to-product heat recovery, thereby reducing energy consumption considerably. Tetra Pak® Tubular Heat Exchangers consist of parts that can be separated for recycling purposes.