



# **SEC**

## **Heat Exchangers**

**SEC Heat Exchangers  
Installation Manual**

**[www.heatexchangers.ca](http://www.heatexchangers.ca)**

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## Description Of SEC Heat Exchangers

Counter flow units made of stainless steel used in both heating and cooling systems.  
 Non-removable parts. Ideal for steam or water heating systems.  
 Helically corrugated tubes coiled in a spiral tube bundle.  
 Vertical installation reduces space requirements.

### Where They Can Be Installed

- Heating systems
- Chilled water systems
- Ground water systems
- Residential use

### Advantages Of SEC Heat Exchangers

**Low maintenance:** helically corrugated tubes cause turbulence which results in an increase in heat transfer efficiency and in reduction of scale buildup and fouling.

**Compact size and light weight** requires less installation space and low installation costs.

**Flexibility of design:** wide range of types and configurations. Increase or decrease required capacity by adding or removing units.

**Flexibility of conditions:** wide range of pressures, flows and temperatures.

**Low cost of maintenance:** compact, lightweight and can be easily removed from piping systems and flushed if necessary.

**High efficiency:** helically corrugated tubes dramatically increase efficiency of heat transfer in comparison to existing plate or shell & tube heat exchangers.

### Availability

Within 24 hours of receiving your heat transfer data we will forward pricing, technical data and delivery status to you. The model best suited to your application has been matched, by our computer selection program, to 1 of more than 30 in stock models. Delivery to any major center in North America is routinely 2 to 3 days, however next day delivery can be arranged at minimal cost.

Our heat exchangers are designed, tested, and manufactured to ASME Code Sec. VIII, Div.1 and will bear U or UM stamp accordingly. SEC heat exchangers are certified by many international and national technical inspection authorities. The heat exchangers are CSA approved, ISO-9002 registered and have obtained the CRN in the Canadian provinces.



## **SEC Heat Exchanger Technology**

SEC heat exchangers were designed with the end-user in mind, a high efficiency shell and tube heat exchanger fabricated from stainless steel 316L that is flexible to use in a wide range of capacities and applications. Its unique features include circular layers of helically, corrugated tubes, a compact design and connection angles ranging between 100°-105°.

Turbulent flow is the dominant mode of fluid flow through the heat exchanger. Whereas in a laminar flow the flow structure is characterized by smooth motion of fluid layers with no mixing of adjacent fluid layers, a turbulent flow is characterized by random, three-dimensional motion of fluid particles. The mixing of fluid layers is a result of velocity fluctuations present in turbulent flow.

Turbulent flow, or mixing of fluid layers, is desired in the heat exchangers. It provides a better mixing, or distribution, of heat in both the shell and tube. The random movement of fluid particles also reduces deposit buildup by performing a “scoop ‘n lift” action with debris lodged along the heat exchanger surfaces. Although turbulence is a direct function of the density and viscosity of the fluid, the flow velocity, and size of the tubes, the corrugated tubes inside SEC heat exchangers induces more turbulence to the flow due to its “bumpy” shape. As a result, the heat exchangers are highly efficient units and may be categorized as self-cleansing.

SEC heat exchangers differ from other shell & tube heat exchanger by the shape and placement of the corrugated tubes inside the shell. The tubes are fabricated into helical coils. The coils are placed inside each other to form circular layers that makes up the tube bundle. Each layer flows in the opposite direction to the layers surrounding it resulting in an overall crisscross pattern.

This design offers many advantageous over the conventional, straight tube heat exchangers. The large number of tubes closely packed together provides a large heat transfer area within a compact space, resulting in higher performance at a relatively lower cost. The layers of tubes in the criss-cross pattern provides rapid and more uniform heating of fluids which increases the overall heat transfer coefficient.

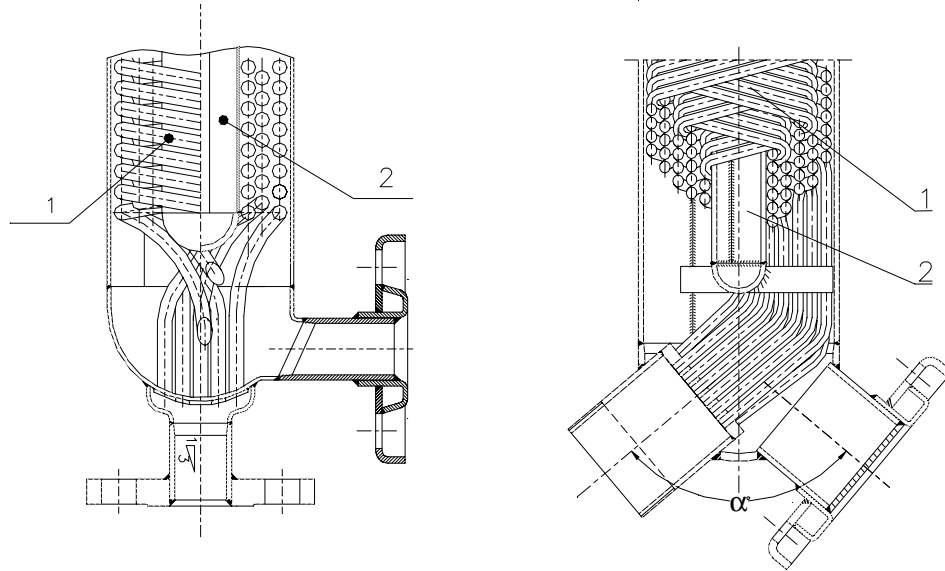
The heat exchangers are designed for vertical installation. This, along with their compact size, enables them to be installed in any application. The design requires less installation space and low installation costs.

Depending on the type of heat exchanger, the center-to-center angle of the connections ranges from 100° to 105°, not the traditional 90° angle. This forms a gradual flow entrance and reduces any sharp corners where flow separation may occur, resulting in an appreciable head loss. The entrance angle also prevents debris from lodging in corners, which often occurs with sharp corners.

## Construction Features

The heat exchangers are designed and fabricated as a single unit with non-removable parts.

The cylindrical shell encloses a tube bundle, which consists of circular layers of helically, corrugated tubes.



**Figure 1 Cross-section of C.xx.xx.90 (left) and C or Pxx.xx.50 (right) type heat exchangers.**

### 1-Tube bundle, 2-Core

Each layer flows in the opposite direction to the layers surrounding it in a criss-cross manner. The tube bundle has perforated bottoms which are welded near the connections. Both ends of the cylindrical shell are enclosed within hemispherical heads.

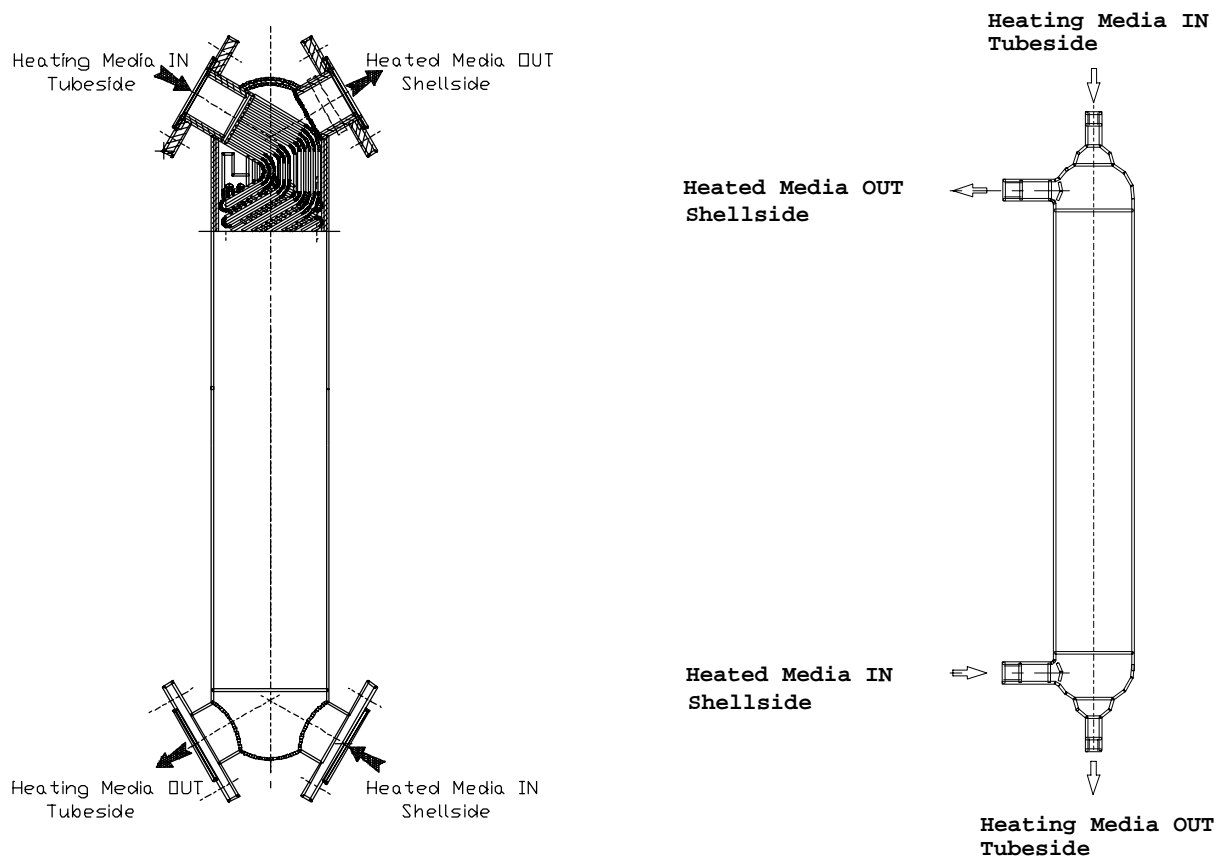
**P-type** heat exchangers consist of tube bundles made of smooth tubes. **C-type** heat exchangers consist of tube bundles with corrugated tubes. **CS-type** heat exchangers are shortened versions of the C-type and are usually installed in applications where there are height limitations. C.xx.xx.90 type heat exchangers have straight, 90° angle connections. C.xx.xx.50 type heat exchangers have connections at 50° from the central axis.

Each heat exchanger has a total of four (4) symmetrically located connections, two on each hemispherical head. One pair of opposing connections is connected to the tube side while the other pair is connected to the shell side.

## Operating Principles

A heat exchanger is a device in which heat is transferred from one flowing fluid to another. Shell and Tube heat exchangers are the most common type of heat exchangers for liquid/liquid service although many applications also involve steam and certain gases. SEC heat exchangers are counter flow units, which from a thermodynamic point of view extract more heat from a given fluid stream than the other common types of heat exchangers.

Normally, the heating medium flows through the tubes, although for specific properties or conditions (e.g. high viscosity, high pressure drops), the heating medium can flow through the shell side. Thermal energy is transferred through the tube walls. The total heat load is dependent on the flow parameters of the fluid.



**Figure 2 Flow distribution in heat exchangers**

## **Construction Materials**

SEC heat exchangers are typically manufactured according to the following table, although different materials may be used to suit specific customer requirements.

### **Standard Materials**

Shell	ASTM316L
Tubes	ASTM316L
Nozzle	ASTM 31 6L
Connection flanges	ASTM 3 16L

## **Operating Parameters and Selection**

Maximum working parameters of the heat exchangers are as follows:

### **Design Pressure**

Shell	250 psig	(1.7MPa)
Tube	250 psig	(1.7MPa)

### **Design Temperature**

Shell	406 °F (208 °C)
Tube	406 °F (208 °C)

In order to select the proper heat exchangers, a customer should specify the following information:

- type of medium
- required heat load
- required inlet/outlet temperature of heating medium
- required inlet/outlet temperature of heated medium

Selection is made through a computer software program developed by SEC and distributed to our customers.

## Operating Precautions

In order to achieve maximum performance from the heat exchanger, the following must be strictly followed:

- Heat exchangers should be used according to the specification provided by SEC.
- Pressures and temperatures should not exceed limits set forth in the *Operating Parameters and Selection of Heat Exchangers*.
- Initial start up should be done according to *Start Up Instructions*
- Heat exchangers should be free of any debris existing in the fluid.
- In central heating applications, the hot water should not exceed 140 °F (60° C).  
Over this limit, lime will form on the tube walls.
- Prevent evaporation of fluid on the shell side. Steam or vapor should only flow through the tubes.
- Clean heat exchangers according to *Cleaning Instructions*
- The system should be designed to prevent the heat exchanger from encountering pressure shocks.
- Prevent rapid temperature increases in the heat exchangers. This would include installation of expansion tanks and safety valves into the system.
- Prevent any of the fluids from dropping below their freezing point.

## Installation Instructions

SEC Heat exchangers should be mounted vertically by means of stainless steel brackets or stands. They can be mounted to a wall or can stand individually away from the wall by use of the stands. Install the heat exchanger in a manner where it will not be exposed to mechanical stresses or moments. (example: in cases of pipe expansions, use expansion compensators to relieve the stress from the connections of the heat exchanger). Contact of carbon steel with the heat exchanger is not allowed.

The following page contains examples of mounting techniques:

## Mounting Examples

Figure 3 : Mounting examples for the SEC C, CS & P Type heat exchangers

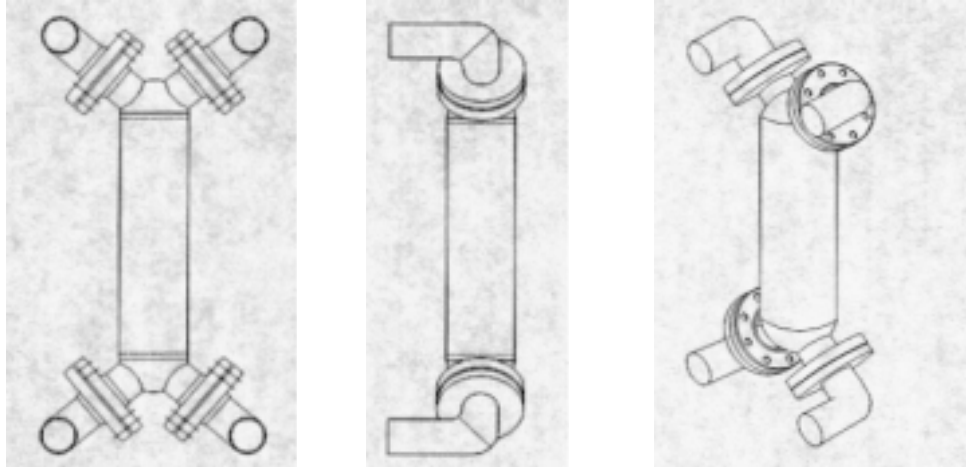
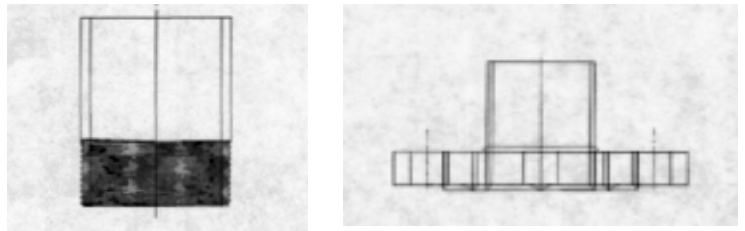


Figure 4: Mounting example of the SEC PL/PLT, C & CS Type heat exchangers.



### Connections:

Figure 5: Threaded & Flanged connections



SEC Heat Exchangers may be mounted vertically, or tilted to a maximum of 50° from vertical.

The center-to-center angle of the **C, CS or P Type** connection is 100°.

Please consult an SEC sales person for other mounting options.

## **Name Plate**

The name plate is placed on the shell and includes the following data:

- type of heat exchanger
- serial number
- production year
- maximum working pressure and temperature
- heat transfer area
- ASME and CSA stamps of approval
- CRN registration number
- manufacturer logo
- manufacturer code

## **Storage & Transportation**

SEC Heat Exchangers should be stored in a clean place away from corrosive environments or weather elements (e.g. rain). During transportation, ensure that they are not exposed to mechanical damages.

## **Startup Instructions**

To prepare the heat exchanger for operation, it should initially be:

- mounted properly
- filled with working fluids
- deaerated
- all connections checked for leaks

During startup, first open the valves, then start the pump of the heated medium followed by opening the cycle of the heating medium. The valves should be opened gradually in order to achieve a steady increase in flow and pressure. The pressure increase/decrease should not exceed 0.5 MPa/min (72 psi/mm.).

## **Insulation Instructions**

After the mounting and installation of the heat exchanger, followed by inspection for leaks, the units should be insulated. Insulation would prevent heat loss to the surroundings and in cases of high temperature use, would also protect the operators.

## **Cleaning Instructions**

SEC Heat Exchangers should be cleansed by flushing the units with fluids which do not react with stainless steel. Dirt deposited in the heat exchanger will result in an increase in pressure drop, lower temperature difference in the heated medium or a higher exit temperature on the heating medium side.

Flushing can be done without removal of the heat exchanger from the system, although extra connections and bypasses would be required.

The following fluids are prohibited for use as a flushing agent:

- hydrochloric acid up to 0.1 % concentration
- solutions which contain  $\text{MCl}$
- Chlorides ( $\text{MgCl}_2$ ,  $\text{NaCl}$  between 0.01 - 1%,  $\text{CuCl}$  up to 1%,  $\text{CaCl}_2$  from 5% to saturation,  $\text{KCl}$ ,  $\text{MgCl}_2$ )
- any fluid which would deposit alkaline residue or phosphorous

The cleaning solutions are easily assessable at businesses carrying chemical cleaning agents for heat exchangers or tubing and piping applications. As a guideline to purchasing the cleaning solutions, check for the following product data:

- compatibility with stainless steel
- accepted for use in food processing industries (if applicable)
- removes scale, slag, tarnishes, and hard water deposits
- easily rinsed out of the system
- no objectionable or corrosive fumes

## **Certification**

SEC Heat Exchangers are designed and fabricated in accordance with ASME Code Sec.VIII, Div.1 for symbols "U" and "UM". SEC Heat Exchangers are CSA approved and have obtained the CRN in the Canadian provinces and are ISO-9002 certified.

Copies of the above certificates are available upon request.

## **Warranty Information**

SEC guarantees its products are free of defective materials and faulty workmanship. Commencing with date of shipment, SEC's warranty runs for 12 months. Should the product fail to perform according to the specifications set forth by SEC during the warranty period, SEC will repair or replace without charge the products that it finds defective.

SEC will not be responsible for any products that operate outside of the conditions and parameters given to SEC at the time of purchase, or any product which have been installed incorrectly.

## **Sales and Service**

SEC Heat Exchangers serves its customers through a network of distributors. For application assistance, performance specifications, pricing, or name of the nearest Authorized Distributor, contact us at:

SEC Heat Exchangers  
2546 Iona Road Building #2  
Belfast, Prince Edward Island  
Canada C0A 1A0  
Toll Free 1.800.335.6650  
Tel: 1.902.566.2446  
Fax 1.902.566.5030  
Email: [pm@isn.net](mailto:pm@isn.net)  
[www.heatexchangers.ca](http://www.heatexchangers.ca)

**SEC Heat Exchanger Quote Form**



**To find out which type of our heat exchangers will best suit your requirements please complete this form and send it to us**

Name: \_\_\_\_\_ Company: \_\_\_\_\_  
 Address: \_\_\_\_\_ City: \_\_\_\_\_  
 State: \_\_\_\_\_ Country: \_\_\_\_\_ Zip Code: \_\_\_\_\_  
 Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ Email: \_\_\_\_\_  
 Project Reference: \_\_\_\_\_ Quantity: \_\_\_\_\_  
 Material of Construction: \_\_\_\_\_  
 Type Of Heat Exchanger: \_\_\_\_\_ Delivery Required by: \_\_\_\_\_ In Weeks

**SIDE 1**

**SIDE 2**

FLUID TYPE: _____	_____
FLOW RATE: _____	_____
INLET TEMPERATURE: _____ C° or F°	_____ C° or F°
OUTLET TEMPERATURE: _____ C° or F°	_____ C° or F°
ALLOWABLE PRESSURE DROP: _____	_____
DESIGN PRESSURE: _____	_____
Optional Data If Known: _____	_____
HEAT TRANSFERRED (CAPACITY): _____	_____
DENSITY @ TEMPERATURE: _____	_____
THERMAL CONDUCTIVITY: _____	_____
SPECIFIC HEAT: _____	_____
VISCOSITY: _____	_____
PHASE CHANGE: _____	_____

**Photocopy and Fax Form to 902-566-5030**



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