Cambridge Reactor Design
Unit D2
Brookfield Business Centre
Twentypence Road, Cottenham
Cambridge, CB24 8PS

T +44 (0) 1954 252522
F +44 (0) 1954 252566
E sales@crduk.com
W www.crduk.com

Salamander Jacketed Reactor - *With Static Mixers*

Principles of Operation

Tubular reactors filled with static mixing elements are often used as plug flow reactors for chemical reaction systems.

In the making of chemical product, a simple jacketed stirred tank with supporting auxiliary equipment is the traditional means of completing chemical reactions. In many cases and for various reasons, a batch system may be best for a particular chemical synthesis. That said, it is sometimes desirable to operate continuously in order to eliminate batch-to-batch variations, produce a consistent product and to have a compact dedicated continuous reactor to free up use of existing batch equipment. There are many equipment types and arrangements used to achieve continuous operations such as with the use of empty tube reactors or a cascade of stirred tanks.

The typical process goals of a continuous reactor system are that the reaction product are homogeneous with regard to the degree of reaction achieved, molecular weight, molecular weight distribution, viscosity, temperature and other operating conditions and chemical/physical properties. For this, all the material within the reactor must be well mixed and have the same residence time.

In fast chemical reaction systems with no perceptible side reactions, simple empty tube reactors are used. When fluid viscosities are water like, empty pipe reactors operating in deep turbulent flow often work well. With increasing viscosity resulting in laminar flow operating conditions in the pipe reactor, static mixing elements are required to be installed in the pipe to assure good mixing of the reacting materials. Moreover, in slow chemical reaction systems, long residence times are required to complete the reaction. These chemical reaction systems may be low or high viscosity throughout their entire reaction life cycle or viscosity may increase/decrease at various stages of the reaction. In addition, secondary reagents may require to be added after initial reaction and heat may be required to be added or removed.

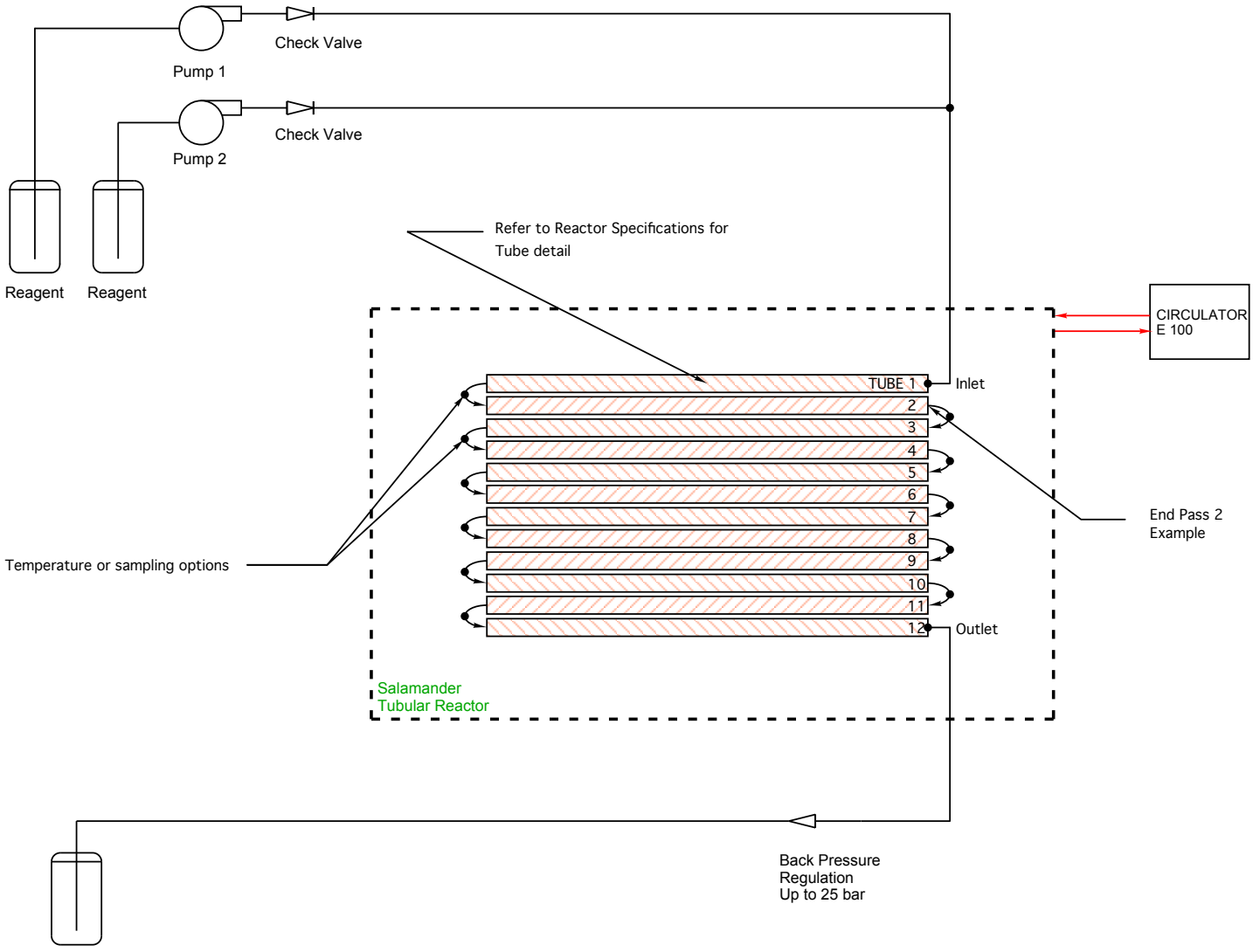
Because slow chemical reaction systems require long residence times, tubular reactors will operate in laminar flow regardless of fluid viscosity. Reactor tubing will normally be filled with static mixing elements where the choice of static mixing element insert may be dependent on the chemistry of the reaction, the diameter of the tube, operating Reynolds number and Bodenstein number, fluid viscosity, heating/cooling requirements, etc.

Description

The Salamander Reactor is a compact, flexible off-the-shelf system designed for flow chemistry. It can be configured to allow a range of residence volumes and sampling options. The stand-alone reactor can be used for cooling or heating. A temperature probe located inside the reactor ensures that an accurate and uniform temperature is maintained over the course of the reaction. When combined with a recirculating chiller and suitable seals, our Salamander can control reactions between -80°C and +200°C (depending on chiller capacity).

Cambridge Reactor Design provides a wide range of static mixer options to compliment the range of reaction and reactor types. Static Mixers are available in materials for example polypropylene (disposable), Teflon, stainless steel and high nickel alloys (e.g. Hastelloy). The schematic illustrates a

typical fluid flow arrangement. However, ours systems can be customized to accommodate a wide range of reaction environments.



Cambridge Reactor Design Ltd
Salamander Reactor with Static Mixers
typical flow Chemistry arrangment

Salamander Tubular Reactor - with Static Mixers

Item	Description	Quantity	Part Number
1	**4 x 3 Array of 3/16" tubes (3.1mm iD), 300mm long**		
1.1	30mL Reactor assembly and Static mixers in 316 Stainless Steel	**1**	44290
1.2	30mL Reactor assembly and Static mixes in C276	**1**	61670
	Inlet, Outlet, No of Accessible ports	**9**	
	Includes 1/16" Type K Temperature probes	**3**	
2	**4 x 3 Array of 5/16" tubes (6.0 mm iD), 300mm long**		
2.1	100mL Reactor assembly and Static mixers in 316 Stainless Steel	**1**	47410
2.2	100mL Reactor assembly and Static mixes in C276	**1**	42210
	Inlet, Outlet, No of Accessible ports	**9**	
	Includes 1/8" PT100 Temperature probes	**3**	
3	**5 x 5 Array of 5/16" tubes (6.0 mm iD), 1000 mm long**		
3.1	600mL Reactor assembly and Static mixers in 316 Stainless Steel	**1**	POA
3.2	600mL Reactor assembly and Static mixes in C276	**1**	71900
	Two Inlets, One Outlet, No of Accessible ports	**3**	
	Includes 1/8" PT100 Temperature probes	**3**	
4	**5 x 5 Array of 5/16" tubes (6.0 mm iD), 1500 mm long**		
4.1	1 L Reactor assembly and Static mixers in 316 Stainless Steel	**1**	POA
	Not Defined		
4.2	1 L Reactor assembly and Static mixes in C276	**1**	
	Two Inlets, One Outlet, No of Accessible ports	**3**	57210
	Includes 1/8" PT100 Temperature probes	**2**	
	One Inlets, One Outlet, No of Accessible ports	**4**	82710
	Includes 1/8" PT100 Temperature probes	**4**	
5	**5 x 5 Array of 1/2" tubes (10.0 mm iD), 1000 mm long**		
5.1	2 L Reactor assembly and Static mixers in 316 Stainless Steel	**1**	POA
5.2	2 L Reactor assembly and Static mixes in C22*	**1**	64630
	Two Inlets, One Outlet, No of Accessible ports	**5**	

	Includes 1/8" PT100 Temperature probes	**3**	
	**For One Inlet and One Outlet configuration, Change the Part Number to 64770*		
6	**5 x 5 Array of 1/2" tubes (10.0 mm iD), 1500 mm long**		
6.1	3 L Reactor assembly and Static mixers in 316 Stainless Steel	**1**	POA
6.2	3 L Reactor assembly and Static mixes in C22*	**1**	POA
	Two Inlets, One Outlet, No of Accessible ports	**5**	
	Includes 1/8" PT100 Temperature probes	**3**	
	**For One Inlet and One Outlet configuration, Change the Part Number to 64770*		

6	**Accessories**	
6.1	Framework	
6.2	FFKM Seals	
6.3	Silicone Insulation	
	Lauda Oil Circulator	
	Temperature Logger	
	Computer Control	