

AN ISO 9001-2000 COMPANY

 **Sigma**<sup>TM</sup>  
GLASS WITH CLASS



## ABOUT SIGMA

Sigma Scientific Glass Pvt. Ltd. Is the leading ISO 9001:2000 certified manufacturer company engaged in manufacturing of borosilicate glass 3.3 industrial process equipments/process plants in India, for chemical industry growing at rapid pace. All our glass equipment comply with ISO 3585/3586/3587 for SIGMA FLAT BUTTRESS ENDS DN 25 to DN 600 and find extensive use in the construction of complete glass process plants/pilot plants in the chemical process industry.

The company was established in 1997 by managing director Mr. Dharmendra Patel with a vision of setting up one reliable source of complete range of industrial glass for chemical industry with highest quality and affordable price. In one decade of its existence the company has proved to be a reputed source of high quality glassware with unmatched service of international standards.

The company has achieved consistent progress every year since inception based on the large numbers of satisfied customers who buy exclusively from us. We are also the largest OEM supplier to the glass industry in India we have now entered into the international markets and have received excellent response from countries like Dubai, Sri Lanka etc.

We are committed to constant innovation and development of new products to meet your increasing demands and requirements. We started manufacturing SIGFOLDI-JACKET™ vessels up to 200ltr cap. from an entirely new design (100% Folding Design) with designed Reg. No. 207576 first time in the world with our capabilities of design, manufacturing and installation, we are perfect one stop for your requirement of borosilicate 3.3 process plant and pilot plants.

We also engaged in manufacturing complete range of glass plant supporting cast Iron and stainless steel (die mould) structure parts along with metal parts like couplings etc. require for glass assemblies.

Every one at our company is motivated by primary motto of high quality in all our activities of manufacturing and servicing. Our large factory with full range of modern machinery with vast material stock is the best source for your borosilicate glass 3.3 equipment requirements.



OUR VISION



OUR MISSION

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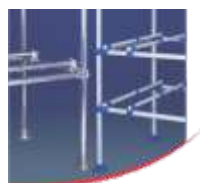
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# TECHNICAL INFORMATION

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## SAFETY

### Pressure relief

Properly designed over-pressure protection systems must be installed to protect the glass process plant, in case the equipment is operated under positive pressure.

### Containment

If the glass process plant is located in such an area, where there is a potential risk of damage due to external mechanical effects (i.e. accidental impact), it is recommended that safety screens are fitted to the main support structure.

If installations are located in the open and operate at relatively high temperatures, they should be protected against thermal shock. This can be achieved by lagging the process equipment.

Most glass process plant are designed for operation at nominally atmospheric pressure. Where the installation is to be operated at a positive pressure, the installation of transparent protective screens will provide extra protection for process plant personnel in the unlikely event of glass ware failure. It should be noted that the energy release following the failure of a pressurised system is significantly greater than a system operated at atmospheric pressure.

For smaller process vessels, secondary spillage containment can be installed in the form of trays or troughs. For larger installations, bunding or a sump arrangement should be considered to provide the necessary containment. In these circumstances it is recommended that the galvanised steel tubular support structure is built on plinths within the bunded area to prevent corrosion of the support feet.

### Coated glass plant and piping

As addition safety, SIGMA offers SIGMACOAT protective coating system to protect glass process plant. The protective coating provides additional protection against risk of injury, release of corrosive liquids or loss of expensive material in the event of accidental breakage. The entire range of glass components listed in the catalogue can be supplied with SIGMACOAT.

**It is important to note that the application of SIGMACOAT does not increase the maximum working pressure.**

The coating is applied in a transparent / translucent form to the glass components. The SIGMACOAT protects the surface of the glass during storage, transport, installation and operation.

SIGMACOAT will protect the glass from impact damage up to a process operating temperature of 125°C.

### GMP - COMPLIANT INSTALLATIONS

Special care is required in the selection of components and equipment for the construction of installations complying with GMP guidelines as regards their design and the materials of construction used. Because of its special properties, which are highly valued in the pharmaceutical industry, and when used in conjunction with materials on the FDA-approved list such as glass lined steel (vessels, valves) and PTFE (bellows, linings, cladding) borosilicate glass 3.3 guarantees that the build-up of deposits is avoided in areas in contact with the product. Minimum dead space to ensure complete draining and a capability for simple and effective cleaning are achieved by the design of the components, their layout and the selection of suitable valves. Stainless steel coupling and support material is available (see section Couplings & Gasket and Tubular Supporting Structure) for the design of complete units complying with clean room conditions from the external aspect.

We would be happy to advise you on the basis of the regulatory requirements applicable in each particular case and the guidelines drawn up by ourselves for the design of GMP - compliant plant.

# PIPELINE COMPONENTS



## INTRODUCTION

SIGMA borosilicate glass 3.3 pipeline is widely used in chemical, pharmaceutical, dyes & allied industries such as food & drink production & electroplating units.

The main reasons for wide acceptance of SIGMA borosilicate glass 3.3 are because of [a] Universal resistance to almost all chemicals resulting in reduced contamination risk, [b] Transparency for ease of visual monitoring of the process [c] Smooth surface allows easy cleaning & sterilization of systems. This guarantees long service life & minimal maintenance requirements.

The complete range of standard pipeline components is described here under. Non-standard components can also be supplied against your order. Many of the components listed in this section are also used in design of process plants. For example pipe sections are used in columns, reducers are used as top & bottom components in columns and feed pipes are fitted on reducing tees. For end finishing available please refer to section Technical Information.

# PIPELINE COMPONENTS

## PIPE SECTIONS

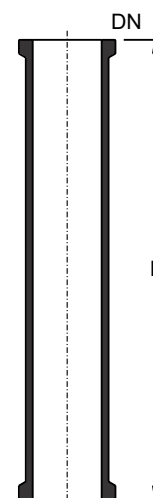
Pipe sections are also used in design of columns other than regular pipelines.

L	Reference DN25	Reference DN40	Reference DN50
75	SFPS 1/75	---	---
100	SFPS 1/100	SFPS 1.5/100	SFPS 2/100
125	SFPS 1/125	SFPS 1.5/125	SFPS 2/125
150	SFPS 1/150	SFPS 1.5/150	SFPS 2/150
175	SFPS 1/175	SFPS 1.5/175	SFPS 2/175
200	SFPS 1/200	SFPS 1.5/200	SFPS 2/200
300	SFPS 1/300	SFPS 1.5/300	SFPS 2/300
400	SFPS 1/400	SFPS 1.5/400	SFPS 2/400
500	SFPS 1/500	SFPS 1.5/500	SFPS 2/500
700	SFPS 1/700	SFPS 1.5/700	SFPS 2/700
1000	SFPS 1/1000	SFPS 1.5/1000	SFPS 2/1000
1500	SFPS 1/1500	SFPS 1.5/1500	SFPS 2/1500

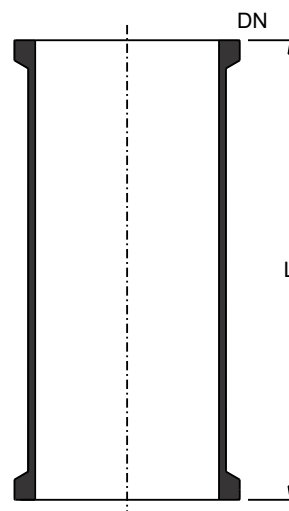
L	Reference DN80	Reference DN100	Reference DN150
125	SFPS 3/125	--	--
150	SFPS 3/150	SFPS 4/150	SFPS 6/150
175	SFPS 3/175	SFPS 4/175	SFPS 6/175
200	SFPS 3/200	SFPS 4/200	SFPS 6/200
300	SFPS 3/300	SFPS 4/300	SFPS 6/300
400	SFPS 3/400	SFPS 4/400	SFPS 6/400
500	SFPS 3/500	SFPS 4/500	SFPS 6/500
700	SFPS 3/700	SFPS 4/700	SFPS 6/700
1000	SFPS 3/1000	SFPS 4/1000	SFPS 6/1000
1500	SFPS 3/1500	SFPS 4/1500	SFPS 6/1500

L	Reference DN225	Reference DN300	Reference DN400
300	SFPS 9/300	SFPS 12/300	-
500	SFPS 9/500	SFPS 12/500	SFPS 16/500
1000	SFPS 9/1000	SFPS 12/1000	SFPS 16/1000
1500	SFPS 9/1500	SFPS 12/1500	SFPS 16/1500

L	Reference DN450	Reference DN600	Reference
500	SFPS 18/500	SFPS 24/500	-
1000	SFPS 18/1000	SFPS 24/1000	-
1500	SFPS 18/1500	SFPS 24/1500	-



DN25 - DN300



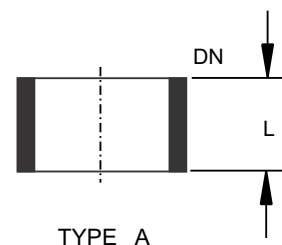
DN400 - DN600

# PIPELINE COMPONENTS

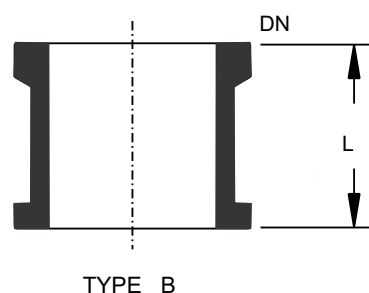
## SPACERS

Spacers can be used to make up small increments in length of pipelines.  
 Small length spacers up to 20 mm can be available in PTFE also.

L	TYPE	Reference DN25	Reference DN40	Reference DN50
10	A	SFSS 1/10	SFSS 1.5/10	SFSS 2/10
15	A	SFSS 1/15	SFSS 1.5/15	SFSS 2/15
20	A	SFSS 1/20	SFSS 1.5/20	SFSS 2/20
25	A	SFSS 1/25	SFSS 1.5/25	SFSS 2/25
50	B	SFSS 1/50	SFSS 1.5/50	SFSS 2/50
75	B	-	SFSS 1.5/75	SFSS 2/75

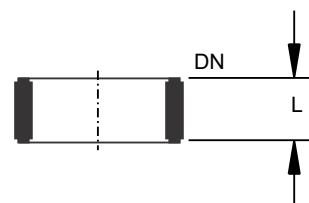


L	TYPE	Reference DN80	Reference DN100	Reference DN150
10	A	SFSS 3/10	SFSS 4/10	SFSS 6/10
15	A	SFSS 3/15	SFSS 4/15	SFSS 6/15
20	A	SFSS 3/20	SFSS 4/20	SFSS 6/20
25	A	SFSS 3/25	SFSS 4/25	SFSS 6/25
50	B	SFSS 3/50	SFSS 4/50	SFSS 6/50
75	B	SFSS 3/75	SFSS 4/75	SFSS 6/75
100	B	SFSS 3/100	SFSS 4/100	SFSS 6/100
125	B	-	SFSS 4/125	SFSS 6/125



## PTFE SPACERS

L	Reference DN25	Reference DN40	Reference DN50
5	SFSST 1/5	SFSST 1.5/5	SFSST 2/5
10	SFSST 1/10	SFSST 1.5/10	SFSST 2/10
15	SFSST 1/15	SFSST 1.5/15	SFSST 2/15
20	SFSST 1/20	SFSST 1.5/20	SFSST 2/20



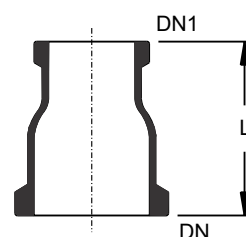
## PIPELINE COMPONENTS

### REDUCERS

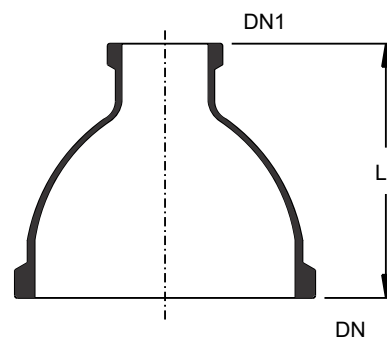
There are basically two types of reducers, concentric & eccentric. Concentric reducers are used in vertical installations. Eccentric reducers are used in horizontal pipelines where there is change of bore to enable complete drainage of material without any hold up.

### CONCENTRIC REDUCERS

DN	DN1	L	Reference
40	25	100	SFPR 1.5/1
50	25	100	SFPR 2/1
50	40	100	SFPR 2/1.5
80	25	125	SFPR 3/1
80	40	125	SFPR 3/1.5
80	50	125	SFPR 3/2
100	25	150	SFPR 4/1
100	40	150	SFPR 4/1.5
100	50	150	SFPR 4/2
100	80	150	SFPR 4/3
150	25	200	SFPR 6/1
150	40	200	SFPR 6/1.5
150	50	200	SFPR 6/2
150	80	200	SFPR 6/3
150	100	200	SFPR 6/4
225	25	250	SFPR 9/1
225	40	250	SFPR 9/1.5
225	50	250	SFPR 9/2
225	80	250	SFPR 9/3
225	100	250	SFPR 9/4
225	150	250	SFPR 9/6
300	25	300	SFPR 12/1
300	40	300	SFPR 12/1.5
300	50	300	SFPR 12/2
300	80	300	SFPR 12/3
300	100	300	SFPR 12/4
300	150	300	SFPR 12/6
300	225	300	SFPR 12/9
400	25	350	SFPR 16/1
400	40	350	SFPR 16/1.5
400	50	350	SFPR 16/2
400	80	350	SFPR 16/3
400	100	350	SFPR 16/4
400	150	350	SFPR 16/6
400	225	350	SFPR 16/9
400	300	350	SFPR 16/12
450	25	375	SFPR 18/1
450	40	375	SFPR 18/1.5
450	50	375	SFPR 18/2
450	80	375	SFPR 18/3
450	100	375	SFPR 18/4
450	150	375	SFPR 18/6
450	225	375	SFPR 18/9
450	300	375	SFPR 18/12
600	50	400	SFPR 24/2
600	100	400	SFPR 24/4
600	150	400	SFPR 24/6
600	225	425	SFPR 24/9
600	300	425	SFPR 24/12
600	450	475	SFPR 24/18



DN40 - DN150

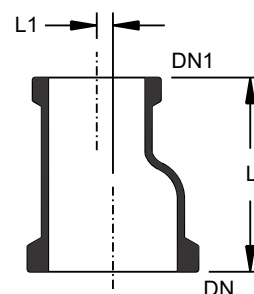


DN225 - DN600

# PIPELINE COMPONENTS

## ECCENTRIC REDUCERS

DN	DN1	L	L1	Reference
40	25	100	6	SFPRE 1.5/1
50	25	100	12	SFPRE 2/1
50	40	100	6	SFPRE 2/1.5
80	25	125	24	SFPRE 3/1
80	40	125	18	SFPRE 3/1.5
80	50	125	12	SFPRE 3/2
100	25	150	39	SFPRE 4/1
100	40	150	33	SFPRE 4/1.5
100	50	150	27	SFPRE 4/2
100	80	150	15	SFPRE 4/3
150	50	200	52	SFPRE 6/2
150	80	200	40	SFPRE 6/3
150	100	200	25	SFPRE 6/4

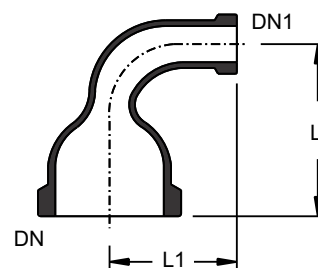


## 90° BEND REDUCERS

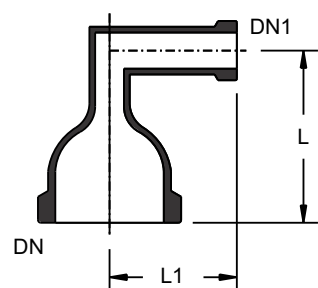
These are alternative to using a reducer & 90° bend simultaneously. This save one connection gasket & coupling and also reduces the overall length required.

DN	DN1	L	L1	Type	Reference
40	25	150	125	A	SFPBR 1.5/1
50	40	150	150	A	SFPBR 2/1.5
80	50	150	150	A	SFPBR 3/2
100	50	200	150	B	SFPBR 4/2
100	80	200	175	B	SFPBR 4/3
150	50	200	150	B	SFPBR 6/2
150	80	250	175	B	SFPBR 6/3
225	80	250	175	B	SFPBR 9/3
300	80	300	175	B	SFPBR 12/3
300	150	350	250	B	SFPBR 12/6

SFPBR are also available in 45°, 80° & 100° on request.



Type -A



Type -B

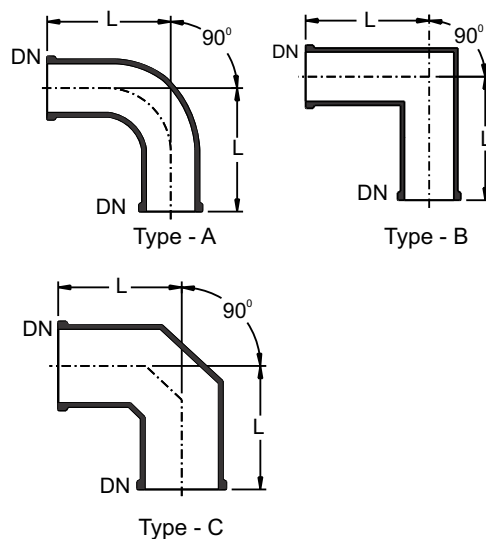
# PIPELINE COMPONENTS

## BENDS

Bends are available in various angles to suit different applications. In addition to the standard range specified below; bends of other angles & larger nominal sizes can also be supplied on request

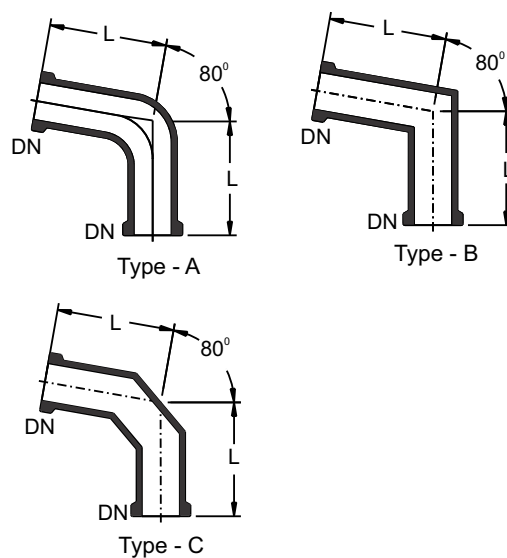
### 90° Bends

DN	L	Type	Reference
25	100	A	SFPB 1/90
40	150	A	SFPB 1.5/90
50	150	A	SFPB 2/90
80	200	B/C	SFPB 3/90
100	250	B/C	SFPB 4/90
150	250	B/C	SFPB 6/90
225	375	B/C	SFPB 9/90
300	450	B/C	SFPB 12/90



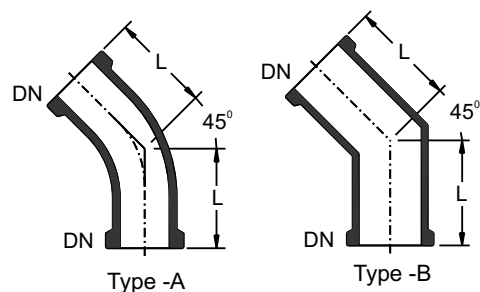
### 80° Bends

DN	L	Type	Reference
25	100	A	SFPB 1/80
40	150	A	SFPB 1.5/80
50	150	A	SFPB 2/80
80	200	B/C	SFPB 3/80
100	250	B/C	SFPB 4/80
150	250	B/C	SFPB 6/80
225	375	B/C	SFPB 9/80
300	450	B/C	SFPB 12/80



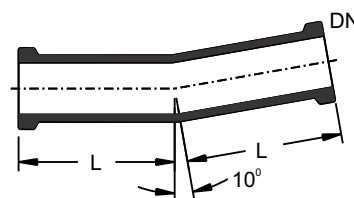
### 45° Bends

DN	L	Type	Reference
25	75	A	SFPB 1/45
40	100	A	SFPB 1.5/45
50	100	A	SFPB 2/45
80	125	B	SFPB 3/45
100	175	B	SFPB 4/45
150	200	B	SFPB 6/45
225	250	B	SFPB 9/45
300	300	B	SFPB 12/45



### 10° Bends

DN	L	Reference
25	50	SFPB 1/10
40	75	SFPB 1.5/10

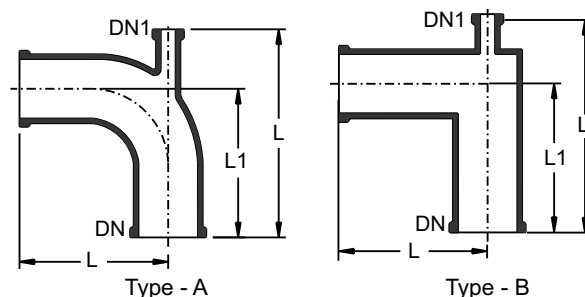


# PIPELINE COMPONENTS

## 90° BENDS WITH THERMOMETER BRANCH

This is variation of 90° bend that allows a thermometer or measuring probe to be inserted axially in to the line.

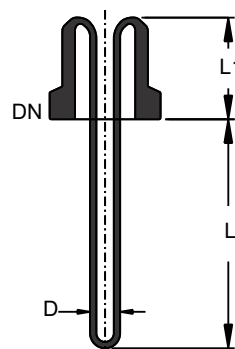
DN	DN1	L	L1	Type	Reference
40	25	225	150	A	SFPBT 1.5
50	25	225	150	A	SFPBT 2
80	25	280	200	A	SFPBT 3
100	25	330	250	B	SFPBT 4
150	25	340	250	B	SFPBT 6
225	25	480	375	B	SFPBT 9
300	25	550	450	B	SFPBT 12



## THERMOMETER POCKET FOR BEND

Thermometer pocket for bend is used to put thermometer where temp needs to be measured.

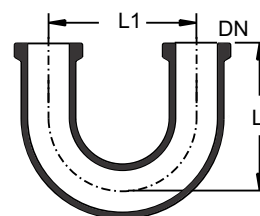
DN	D	L	L1	Reference
25	12	100	50	SFTPBT 1
25	12	100	50	SFTPBT 1.5
25	12	100	50	SFTPBT 2
25	12	100	50	SFTPBT 3
25	12	110	50	SFTPBT 4
25	12	135	50	SFTPBT 6
25	12	160	50	SFTPBT 9
25	12	200	50	SFTPBT 12



## U BENDS

U bends are used to turn the pipeline through 180°.

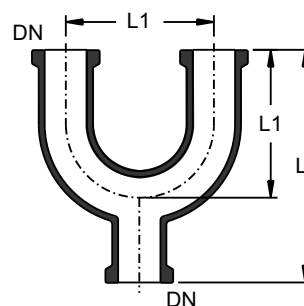
DN	L	L1	Reference
25	150	150	SFPU 1
40	175	175	SFPU 1.5
50	175	175	SFPU 2
80	225	225	SFPU 3



## U BENDS WITH BOTTOM OUTLET

U bends with bottom outlet are typically used for merging two different flow streams in pipeline & as provision of a vented overflow on columns and as liquid seal with drain.

DN	L	L1	Reference
25	250	150	SFPUO 1
40	275	175	SFPUO 1.5
50	275	175	SFPUO 2
40/25	275	175	SFPUO 1.5/1
50/25	275	175	SFPUO 2/1
80/25	350	225	SFPUO 3/1

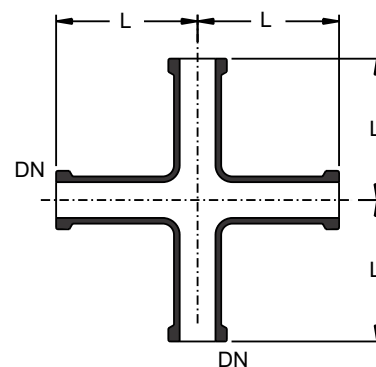


## PIPELINE COMPONENTS

### EQUAL CROSS PIECES

Cross pieces are used in design of interconnecting pipelines.

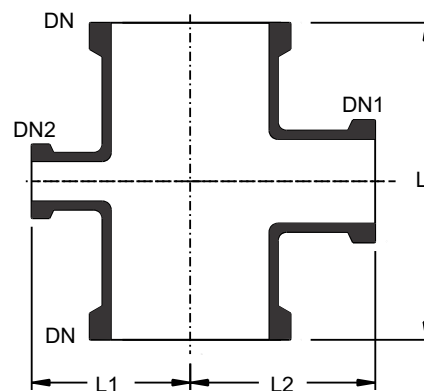
DN	L	Reference
25	100	SFPX 1
40	150	SFPX 1.5
50	150	SFPX 2
80	200	SFPX 3
100	250	SFPX 4
150	250	SFPX 6



### UNEQUAL CROSS PIECES

Unequal cross pieces are used in design of column & interconnecting different size pipelines.

DN	DN1	DN2	L	L1	L2	Reference
50	25	25	200	80	80	SFPXU 2/1/1
50	40	25	200	80	100	SFPXU 2/1.5/1
80	25	25	250	100	100	SFPXU 3/1/1
80	40	25	250	100	100	SFPXU 3/1.5/1
80	50	25	250	100	115	SFPXU 3/2/1
100	25	25	250	110	110	SFPXU 4/1/1
100	40	25	250	110	125	SFPXU 4/1.5/1
100	50	25	250	110	125	SFPXU 4/2/1
100	80	25	300	150	150	SFPXU 4/3/1
150	40	25	250	150	150	SFPXU 6/1.5/1
150	50	25	250	150	150	SFPXU 6/2/1
150	80	50	300	150	175	SFPXU 6/3/2
150	100	50	300	150	200	SFPXU 6/4/2
225	40	40	300	185	185	SFPXU 9/1.5/1.5
225	50	40	300	185	185	SFPXU 9/2/1.5
225	80	40	300	185	210	SFPXU 9/3/1.5
225	100	50	450	185	250	SFPXU 9/4/2
225	150	80	450	210	275	SFPXU 9/6/3
300	50	40	400	230	230	SFPXU 12/2/1.5
300	80	40	400	230	275	SFPXU 12/3/1.5
300	100	40	400	230	275	SFPXU 12/4/1.5
300	150	50	450	230	300	SFPXU 12/6/2
300	225	80	600	275	300	SFPXU 12/9/3
400	40	40	400	275	275	SFPXU 16/1.5/1.5
400	80	40	400	300	275	SFPXU 16/3/1.5
400	100	40	400	300	275	SFPXU 16/4/1.5
400	150	80	500	350	300	SFPXU 16/6/3
400	225	100	800	450	300	SFPXU 16/9/4
450	40	40	400	300	300	SFPXU 18/1.5/1.5
450	80	40	400	320	300	SFPXU 18/3/1.5
450	100	40	400	320	300	SFPXU 18/4/1.5
450	150	80	600	380	320	SFPXU 18/6/3
450	225	100	800	400	320	SFPXU 18/9/4

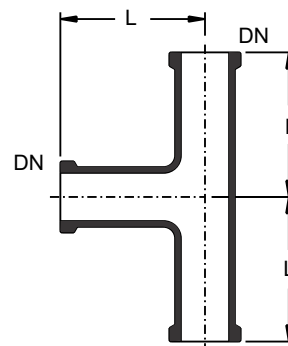


# PIPELINE COMPONENTS

## EQUAL TEE PIECES

Equal tee are used in junction of pipelines with same nominal size.

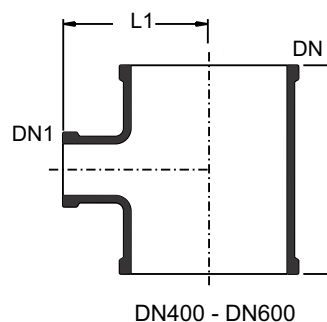
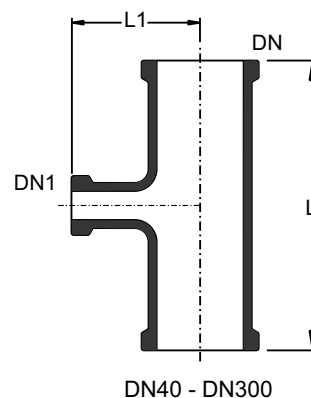
DN	L	Reference
25	100	SFPT 1
40	150	SFPT 1.5
50	150	SFPT 2
80	200	SFPT 3
100	250	SFPT 4
150	250	SFPT 6
225	375	SFPT 9
300	450	SFPT 12



## UNEQUAL TEE PIECES

Unequal tee are used in design of columns & at junction of pipelines of different nominal size.

DN	DN1	L	L1	Reference
40	25	200	75	SFPTU 1.5/1
50	25	200	80	SFPTU 2/1
50	40	200	100	SFPTU 2/1.5
80	25	250	100	SFPTU 3/1
80	40	250	115	SFPTU 3/1.5
80	50	250	115	SFPTU 3/2
100	25	250	110	SFPTU 4/1
100	40	250	125	SFPTU 4/1.5
100	50	250	125	SFPTU 4/2
100	80	300	150	SFPTU 4/3
150	25	250	150	SFPTU 6/1
150	40	250	150	SFPTU 6/1.5
150	50	250	150	SFPTU 6/2
150	80	300	175	SFPTU 6/3
150	100	300	200	SFPTU 6/4
225	25	300	185	SFPTU 9/1
225	40	300	185	SFPTU 9/1.5
225	50	300	190	SFPTU 9/2
225	80	300	210	SFPTU 9/3
225	100	450	250	SFPTU 9/4
225	150	450	275	SFPTU 9/6
300	25	400	230	SFPTU 12/1
300	40	400	230	SFPTU 12/1.5
300	50	400	230	SFPTU 12/2
300	80	400	275	SFPTU 12/3
300	100	400	275	SFPTU 12/4
300	150	450	300	SFPTU 12/6
300	225	600	300	SFPTU 12/9
400	40	400	275	SFPTU 16/1.5
400	50	400	275	SFPTU 16/2
400	80	400	300	SFPTU 16/3
400	100	400	300	SFPTU 16/4
400	150	500	350	SFPTU 16/6
400	225	800	450	SFPTU 16/9
400	300	800	450	SFPTU 16/12



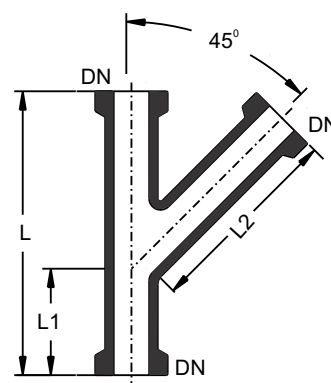
## PIPELINE COMPONENTS

450	40	400	300	SFPTU 18/1.5
450	50	400	300	SFPTU 18/2
450	80	400	320	SFPTU 18/3
450	100	400	320	SFPTU 18/4
450	150	600	380	SFPTU 18/6
450	225	800	400	SFPTU 18/9
450	300	800	400	SFPTU 18/12
600	100	600	450	SFPTU 24/4
600	150	600	450	SFPTU 24/6
600	225	800	525	SFPTU 24/9
600	300	800	525	SFPTU 24/12

### Y PIECES

Y pieces are used at bottom outlet for merging two different flow streams in a pipeline system. It is also used for incorporating measuring probes in vertical pipelines.

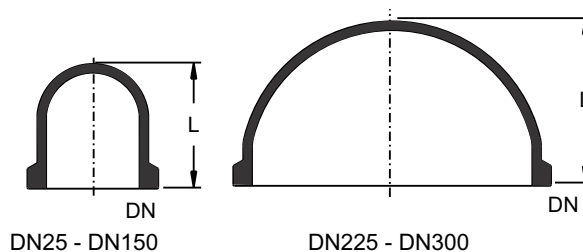
DN	L	L1	L2	Reference
25	200	75	150	SFPY 1
40	250	100	175	SFPY 1.5
50	300	125	200	SFPY 2
80	350	150	250	SFPY 3
100	450	150	350	SFPY 4



### CLOSURES - GLASS

Closures are used where branches are to be closed off

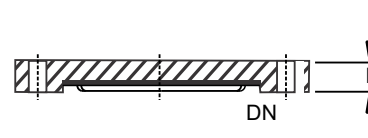
DN	L	Reference
25	40	SFPBE 1
40	50	SFPBE 1.5
50	65	SFPBE 2
80	75	SFPBE 3
100	100	SFPBE 4
150	125	SFPBE 6
225	125	SFPBE 9
300	150	SFPBE 12



### CLOSURES - PTFE

PTFE Closures are used where branches are to be closed off.

DN	L	Reference
25	8	SFPBF 1
40	8	SFPBF 1.5
50	8	SFPBF 2
80	8	SFPBF 3
100	8	SFPBF 4
150	9	SFPBF 6
225	9	SFPBF 9
300	9	SFPBF 12

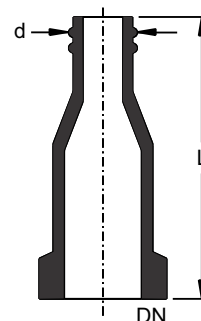


# PIPELINE COMPONENTS

## HOSE CONNECTORS

Hose connectors are used to connect flexible lines [hoses] to carry cooling water to heat exchangers & jacketed components.

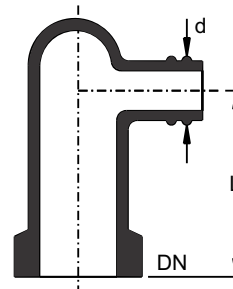
DN	d	L	Reference
25	28	90	SFPHC 1/1
25	22	90	SFPHC 1/.75
25	15	90	SFPHC 1/.5
25	11	90	SFPHC 1/.25
40	28	100	SFPHC 1.5/1
40	22	100	SFPHC 1.5/.75



## 90° HOSE CONNECTORS

In case of long and/or heavy hoses 90° hose connector should be used to reduce the bending moment of connecting branches.

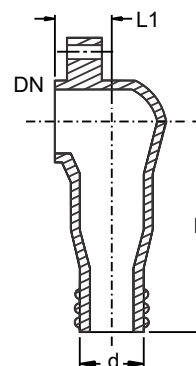
DN	d	L	Reference
25	28	60	SFPBHC 1/1
25	22	60	SFPBHC 1/.75
40	22	75	SFPBHC 1.5/.75
50	22	100	SFPBHC 2/.75



## METAL HOSE CONNECTORS

Metal hose connectors are provided complete with flange, insert, gasket & fastening necessary to connect to glass branch in question.

DN	d	L	Reference
25	22	70	SFPMC 1

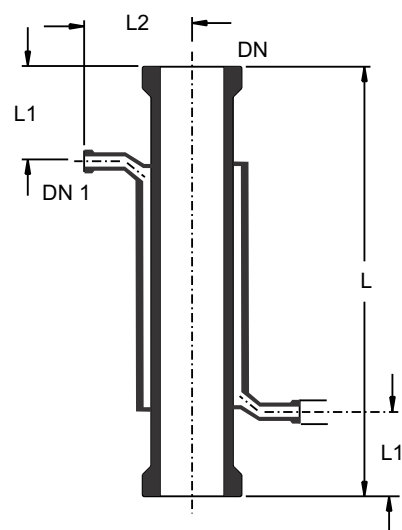


## PIPELINE COMPONENTS

### JACKETED PIPE SECTIONS

Jacketed pipe section provide means for heating & cooling pipeline components to maintain desired temperatures in the system.

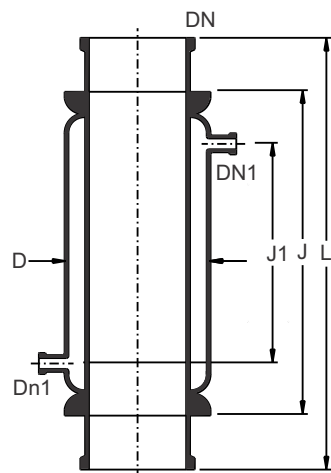
DN	DN1	L	L1	L2	Reference
25	15	200	65	75	SFDPS 1/200
25	15	300	65	75	SFDPS 1/300
25	15	400	65	75	SFDPS 1/400
25	15	500	65	75	SFDPS 1/500
25	15	700	65	75	SFDPS 1/700
25	15	1000	65	75	SFDPS 1/1000
40	15	300	65	80	SFDPS 1.5/300
40	15	400	65	80	SFDPS 1.5/400
40	15	500	65	80	SFDPS 1.5/500
40	15	700	65	80	SFDPS 1.5/700
40	15	1000	65	80	SFDPS 1.5/1000
50	15	300	70	85	SFDPS 2/300
50	15	400	70	85	SFDPS 2/400
50	15	500	70	85	SFDPS 2/500
50	15	700	70	85	SFDPS 2/700
50	15	1000	70	85	SFDPS 2/1000
80	15	300	90	100	SFDPS 3/300
80	15	400	90	100	SFDPS 3/400
80	15	500	90	100	SFDPS 3/500
80	15	700	90	100	SFDPS 3/700
80	15	1000	90	100	SFDPS 3/1000



### METEL JACKETS

Metal Jacketed pipe section can also be provided as means for heating & cooling pipeline components to maintain desired temperatures in the system.

DN	L	D	DN1	J	J1	Reference
80	1000	100	25	850	750	SFPSJ 3/1000
100	1000	135	25	850	750	SFPSJ 4/1000
150	1000	188	25	850	700	SFPSJ 6/1000
225	1000	262	25	850	700	SFPSJ 9/1000
300	1000	345	25	850	650	SFPSJ 12/1000



# SIGHT GLASS



## INTRODUCTION

Sight glass is a device used between any kind of non transparent pipeline to observe the flow of liquid. This can be used both in horizontal as well as vertical pipeline. Sight glass is constructed in such a way that it gives a complete view from every angle.

## q q f v Z q q

A sight glass consists of one glass pipe section, one metal frame, a pair of PTFE bushes and washers and an acrylic cover. Borosilicate pipe section is highly heat resistant, has excellent chemical resistance and has low thermal expansion. Metal frame is composed of two flanges which are welded with studs so that the stresses and vibrations of the pipeline do not transfer to the glass pipe section. Its check nut keeps the glass pipe section in compression and provides ease in replacement.

PTFE bushes on both sides of glass pipe section ensures that liquid in the pipeline does not come in contact with metal frame. PTFE washers are used as gaskets while fitting the sight glass in the pipeline. Acrylic cover covers the glass pipe section and protects it from outer damages.

Sight glass can be supplied with MS/SS304/SS316 frame with any standard drilling.

### MS FRAME SIGHT GLASS

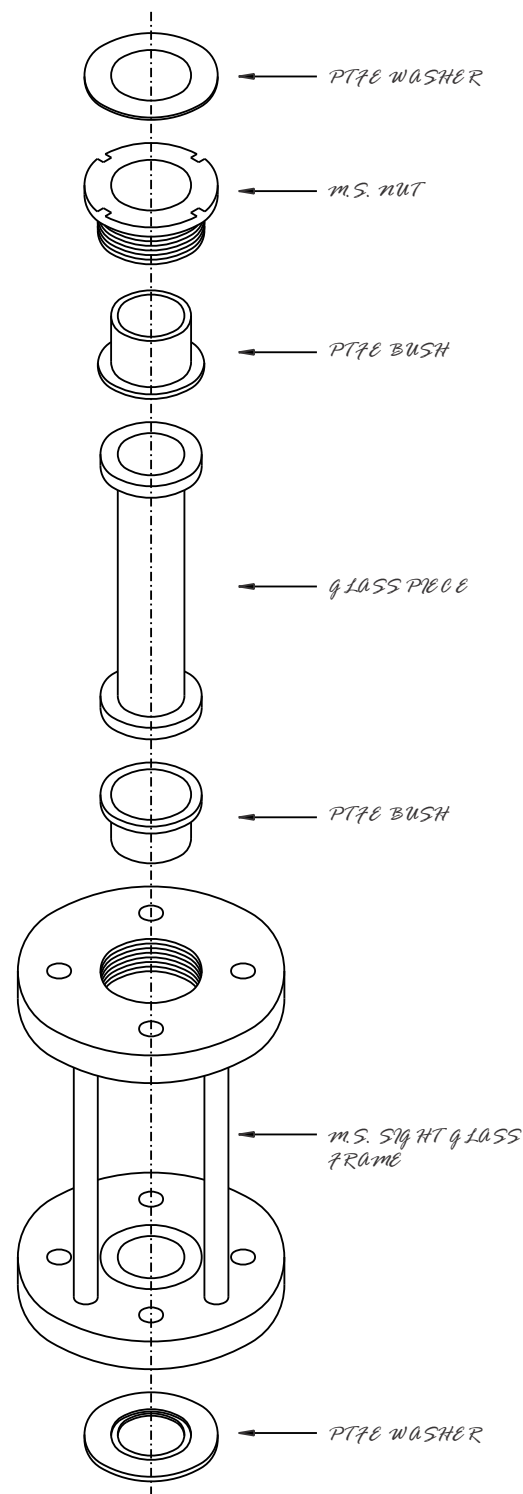
DN	L	L1	Reference Table E	Reference Table F	Reference Table ASA
25	192	150	S7Sg 1/E	S7Sg 1/F	S7Sg 1/A
40	192	150	S7Sg 1.5/E	S7Sg 1.5/F	S7Sg 1.5/A
50	192	150	S7Sg 2/E	S7Sg 2/F	S7Sg 2/A
80	192	150	S7Sg 3/E	S7Sg 3/F	S7Sg 3/A
100	192	150	S7Sg 4/E	S7Sg 4/F	S7Sg 4/A
150	192	150	S7Sg 6/E	S7Sg 6/F	S7Sg 6/A

### SS 304 FRAME SIGHT GLASS

DN	L	L1	Reference Table E	Reference Table F	Reference Table ASA
25	192	150	S7Sg 1/E/304	S7Sg 1/F/304	S7Sg 1/A/304
40	192	150	S7Sg 1.5/E/304	S7Sg 1.5/F/304	S7Sg 1.5/A/304
50	192	150	S7Sg 2/E/304	S7Sg 2/F/304	S7Sg 2/A/304
80	192	150	S7Sg 3/E/304	S7Sg 3/F/304	S7Sg 3/A/304
100	192	150	S7Sg 4/E/304	S7Sg 4/F/304	S7Sg 4/A/304
150	192	150	S7Sg 6/E/304	S7Sg 6/F/304	S7Sg 6/A/304

### SS 316 FRAME SIGHT GLASS

DN	L	L1	Reference Table E	Reference Table F	Reference Table ASA
25	192	150	S7Sg 1/E/316	S7Sg 1/F/316	S7Sg 1/A/316
40	192	150	S7Sg 1.5/E/316	S7Sg 1.5/F/316	S7Sg 1.5/A/316
50	192	150	S7Sg 2/E/316	S7Sg 2/F/316	S7Sg 2/A/316
80	192	150	S7Sg 3/E/316	S7Sg 3/F/316	S7Sg 3/A/316
100	192	150	S7Sg 4/E/316	S7Sg 4/F/316	S7Sg 4/A/316
150	192	150	S7Sg 6/E/316	S7Sg 6/F/316	S7Sg 6/A/316



# VALVES & FILTERS



## INTRODUCTION

SIGMA valves & filters can be relied upon to require minimum maintenance & to provide maximum reliability. They provide relatively easy on off function to control flow & pressure relief.

All wetted parts of valves & filters are made of borosilicate glass 3.3 & PTFE or PFA, which ensures maximum resistance to corrosion. In addition valve glass body provides visual monitoring of valve operation at all times.

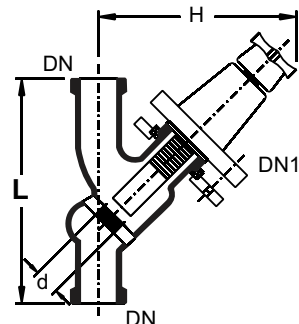
The complete range of standard valves is described in following pages.

## VALVES & FILTERS

### LINE VALVES

This valve provide manual on / off control of fluid.

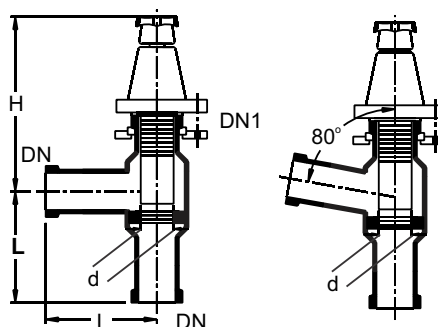
DN	DN1	d	L	H	Reference
25	25	18	175	175	SFPV 1
40	40	26	225	200	SFPV 1.5
40	25	18	225	175	SFPV 1.5/1
50	50	38	300	220	SFPV 2
50	40	26	300	200	SFPV 2/1.5



### ANGLE VALVES

This valve have outlet at perpendicular angle to the inlet nozzle. The angle valves are available in 90° & 80° inlet nozzles angle as shown

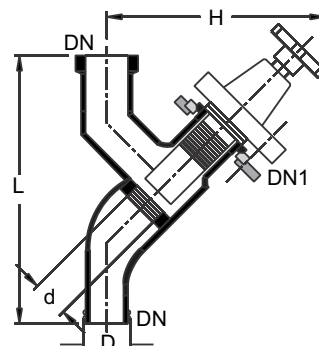
DN	DN1	d	L	H	Reference
25	25	18	100	175	SFPVE 1
40	40	26	150	200	SFPVE 1.5
40	25	18	150	175	SFPVE 1.5/1
50	50	38	150	220	SFPVE 2
50	40	26	150	200	SFPVE 2/1.5



### DRAIN VALVES

These valves have hose connector nozzle design at the outlet to ensure secure connection to hose.

DN	DN1	d	L	H	D	Reference
25	25	18	175	175	28	SFPVD 1
40	25	18	225	175	28	SFPVD 1.5/1
40	40	26	225	200	42	SFPVD 1.5
50	50	38	300	220	50	SFPVD 2
50	40	26	300	240	50	SFPVD 2/1.5

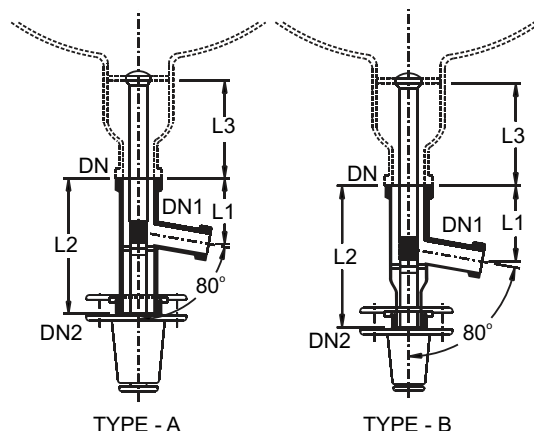


# VALVES & FILTERS

## BOTTOM OUTLET VALVES

These valves close from below the vessel with integral sealed in glass seal eliminating dead space. The flush design of the spindle in these valves prevents accumulation of solids & liquids in the bottom outlet of the vessel. These valves are used in reaction vessels & can also be used in any spherical or cylindrical vessel.

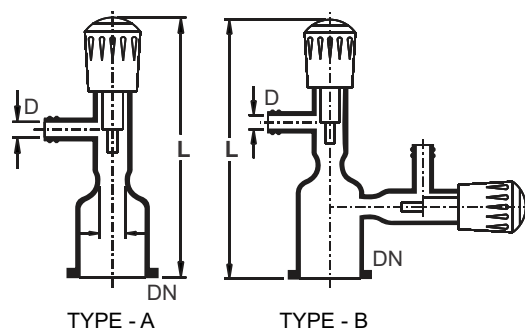
DN	DN1	DN2	L1	L2	L3	TYPE	Reference
40	19	40	50	100	165	A	SFBAS 1.5
50	25	40	90	140	150	A	SFBAS 2
40	25	40	100	175	165	B	SFBAL 1.5
50	40	25	90	175	175	B	SFBAL 2



## VENT VALVES

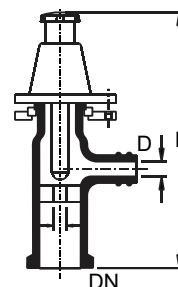
These valves are ideal for venting plants operating under vacuum, atmospheric pressure or at low positive pressure (up to 0.5 bar Hg),

DN	D	d	L	TYPE	Reference
25	11	10	150	A	SFPVL 1
40	11	10	150	A	SFPVL 1.5
25	11	10	150	B	SFPVLR 1
40	11	10	150	B	SFPVLR 1.5



## VENT VALVES (BAKELITE TYPE)

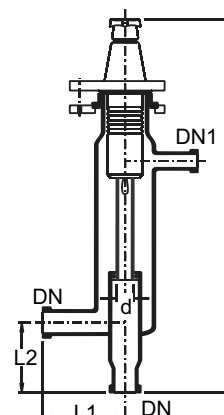
DN	D	d	L	Reference
25	12/19	10	150	SFPVLB 1
40	19	20	220	SFPVLB 1.5



## ADJUSTABLE OVERFLOW VALVES

These valves provide an external adjustment of the level inside a vessel. They are ideal to use with liquid separators or liquid-liquid extractors. Its position can be adjusted within set limits to set the required overflow rate.

DN	DN1	d	L	L1	L2	I/HR.	Reference
25	25	25	420	100	50	600	SFOF 1
40	25	25	600	150	90	900	SFOF 1.5
50	25	35	600	150	90	1600	SFOF 2

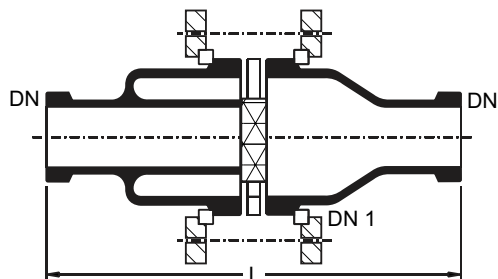


## VALVES & FILTERS

### NON-RETURN VALVES flap type

These valves can be used in both horizontal & vertical lines. These valves provide a large free cross-section even in small nominal sizes & consequently ensure low pressure drop.

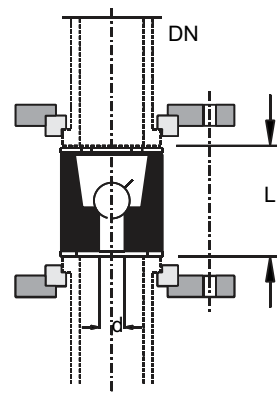
DN	DN1	L	Reference
25	50	225	SFRK 1
40	80	275	SFRK 1.5
50	100	325	SFRK 2
80	150	410	SFRK 3
100	225	510	SFRK 4



### NON-RETURN VALVES ball type

These valves can be used in vertical lines only. These valves ensure that flow in vertical pipelines will be in one direction.

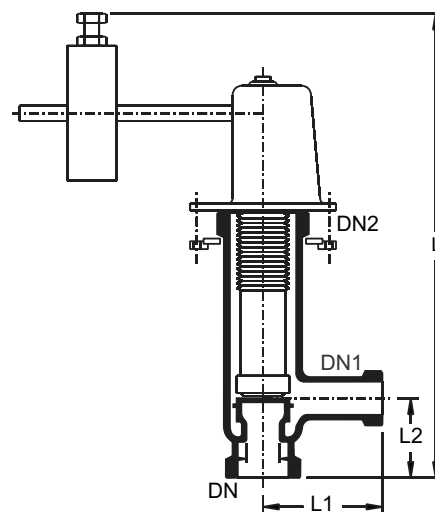
DN	d	L	Reference
25	10	25	SFNRD 1
40	15	33	SFNRD 1.5
50	19	41	SFNRD 2
80	30	65	SFNRD 3



### PRESSURE RELIEF VALVES

These weight-operated valves are constructed of glass & PTFE. Blow off pressure can be varied by adjusting the location of weight.

DN	DN1	DN2	d	L	L1	L2	Reference
40	25	50	25	350	90	60	SFSVG 1.5



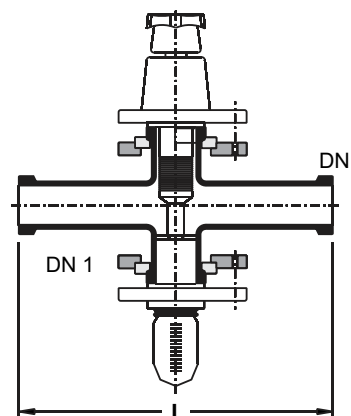
# VALVES & FILTERS

## SAMPLING VALVES

These valves are designed for installation in horizontal pipelines. There are two different versions one for under vacuum operation & other for positive or atmospheric pressure.

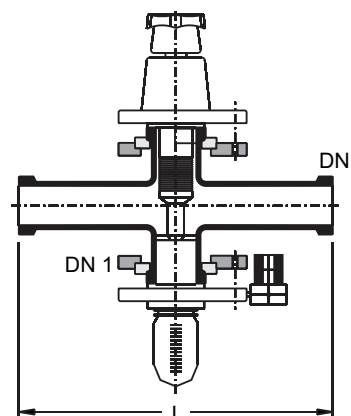
### Sampling Valves for Atmospheric and Positive Pressure.

DN	DN1	L	Reference
25	40	200	SFSVA 1
40	40	300	SFSVA 1.5
50	40	300	SFSVA 2



### Sampling Valves for Vacuum

DN	DN1	L	Reference
25	40	200	SFSVV 1
40	40	300	SFSVV 1.5
50	40	300	SFSVV 2

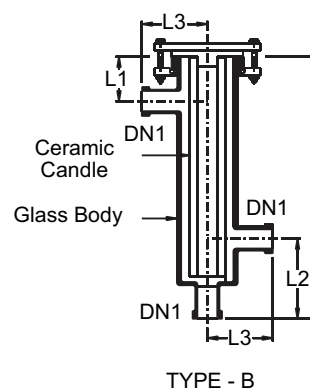
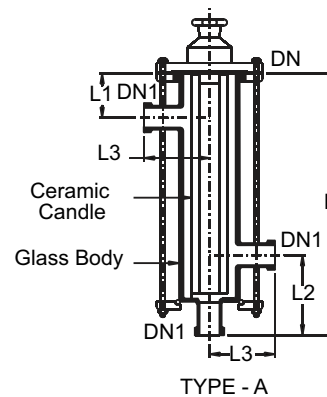


## VALVES & FILTERS

### PIPELINE FILTERS

Pipeline filters are recommended to remove impurities from gas & liquid streams in glass pipelines. The assembly is designed such that the filter can be easily removed for cleaning or replacement.

DN	DN1	L	L1	L2	L3	Type	Reference
80	25	365	60	175	100	A	SFPFC 3
100	40	500	85	225	125	B	SFPFC 4



# VESSELS & STIRRERS



## INTRODUCTION

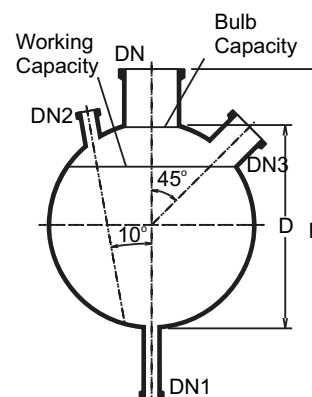
SIGMA vessels & stirrers provide best solution for all requirements encountered in production processes because of wide range of vessels available. Vessels in either unjacketed or jacketed form are essential components of many units & plants. The vessels can be combined with various components as stirrers, stirrer drive, vessel covers & heat exchangers to construct wide variety of stirred units & reaction systems. These vessels find universal application as reactors, receivers, reboilers, separators, measuring, feed vessels & storage vessels in chemical industry. The complete range of standard vessels & assemblies is described in following pages. Non-standard assemblies can also be supplied. Please feel free to ask us for the same.

## VESSELS & STIRRERS

### SPHERICAL VESSELS - General Data

Spherical vessels are used not only as receivers & feed vessels but mainly as stirred reaction vessels & circulatory evaporators. To cater to the varied uses of spherical vessels; a detailed list of various designs of spherical vessel manufactured by us are listed below. We can also provide you with nozzle orientation as per your requirements, which may be different from the standards listed in our brochure.

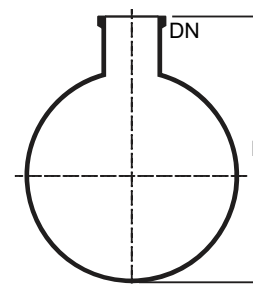
Nominal Cap. Ltr.	Bulb Cap. Ltr.	Working Cap. Ltr.	Bulb dia (mm) D	Maximum Pressure (bar g)	Tolerance of dia (mm)	Tolerance in Length (mm)
5	6	5	220	1	±2	±5
10	12	10	285	0.7	±2	±5
20	21	20	350	0.6	±2	±5
50	60	50	485	0.4	±3	±5
100	118	100	600	0.3	±4	±5
200	212	200	750	0.25	±5	±8
300	312	300	850	0.20	±6	±8



### SINGLE NECK SPHERICAL VESSELS

Nominal Cap. Ltr.	DN MM	L MM	Reference
5 L	40	300	SFVSA 5
10 L	40	375	SFVSA 10
20 L	80	450	SFVSA 20
50 L	100	650	SFVSA 50
100 L	150	750	SFVSA 100
200 L	225	950	SFVSA 200
300 L	300	1100	SFVSA 300

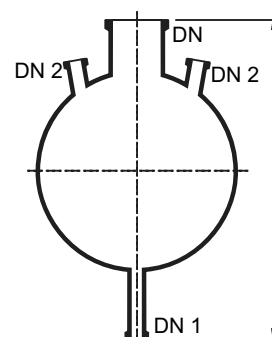
Tolerance ± as per given general data in vessel chapter.



### THREE NECK BOTTOM OUTLET SPHERICAL VESSELS

Nominal Cap. Ltr.	L	DN	DN1	DN2	Reference
5 L	425	40	25	25	SFVSM 5
10 L	500	40	25	25	SFVSM 10
20 L	575	80	25	25	SFVSM 20
50 L	825	100	40	40	SFVSM 50
100 L	925	150	40	40	SFVSM 100
200 L	1175	225	40	40	SFVSM 200
300 L	1225	300	50	50	SFVSM 300

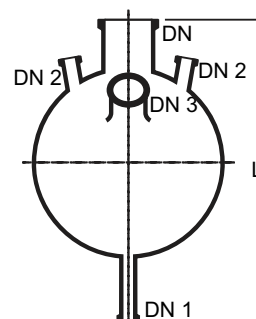
Tolerance ± as per given general data in vessel chapter.



### FOUR NECK BOTTOM OUTLET SPHERICAL VESSELS

Nominal Cap. Ltr.	L	DN	DN1	DN2	DN3	Reference
5 L	425	40	25	25	40	SFVSPL 5
10 L	500	40	25	25	40	SFVSPL 10
20 L	575	80	25	25	40	SFVSPL 20
50 L	825	100	40	40	100	SFVSPL 50
100 L	925	150	40	40	100	SFVSPL 100
200 L	1175	225	40	40	100	SFVSPL 200
300 L	1225	300	50	50	100	SFVSPL 300

Tolerance ± as per given general data in vessel chapter.

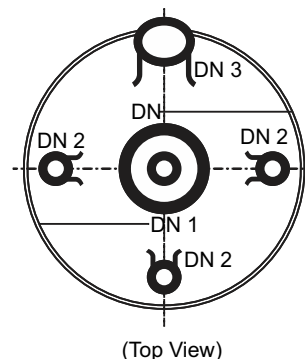


## VESSELS & STIRRERS

### FIVE NECK BOTTOM OUTLET SPHERICAL VESSELS

Nominal Cap.Ltr.	L	DN	DN1	DN2	DN3	Reference
5 L	425	40	25	25	40	SFVSL 5
10 L	500	40	25	25	40	SFVSL 10
20 L	575	80	25	25	40	SFVSL 20
50 L	825	100	40	40	100	SFVSL 50
100 L	925	150	40	40	100	SFVSL 100
200 L	1175	225	40	40	100	SFVSL 200
300 L	1225	300	50	50	100	SFVSL 300

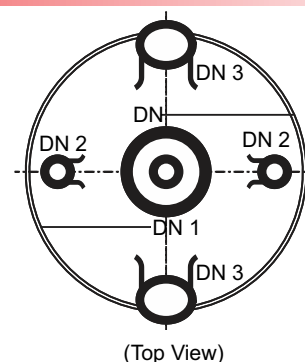
Tolerance  $\pm$  as per given general data in vessel chapter.



### FIVE NECK BOTTOM OUTLET SPHERICAL VESSELS

Nominal Cap.Ltr.	L	DN	DN1	DN2	DN3	Reference
5 L	425	40	25	25	40	SFVS 5
10 L	500	40	25	25	40	SFVS 10
20 L	575	80	25	25	40	SFVS 20
50 L	825	100	40	40	100	SFVS 50
100 L	925	150	40	40	100	SFVS 100
200 L	1175	225	40	40	100	SFVS 200
300 L	1225	300	50	50	100	SFVS 300

Tolerance  $\pm$  as per given general data in vessel chapter.

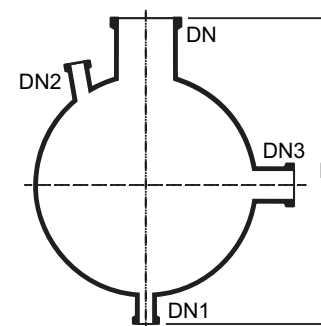


### SPHERICAL VESSELS WITH NOZZLE AT 90°

These vessels are used in circulatory boiler system. More nozzles can be provided on the equator on request.

Nominal Cap.Ltr.	L	DN	DN1	DN2	DN3	Reference
5 L	375	40	25	25	50	SFVSD 5
10 L	450	40	25	25	50	SFVSD 10
20 L	525	80	25	25	50	SFVSD 20
50 L	725	100	40	40	80	SFVSD 50
100 L	825	150	40	40	80	SFVSD 100
200 L	1075	225	40	40	150	SFVSD 200
300 L	1125	300	50	50	150	SFVSD 300

Tolerance  $\pm$  as per given general data in vessel chapter.

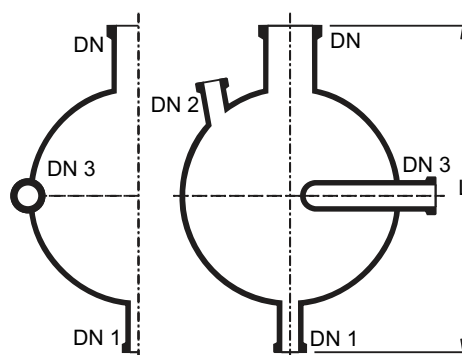


### SPHERICAL CYCLONES

Cyclones can be used for the separation of droplets and solids from gases and vapours. Cyclones are to be supported on a vessel holder. A dip pipe should be used on the top neck.

Nominal Cap.Ltr.	L	DN	DN1	DN2	DN3	Reference
5 L	375	40	25	25	40	SFVSCY 5
10 L	450	40	25	25	40	SFVSCY 10
20 L	525	80	25	25	50	SFVSCY 20
50 L	725	100	40	40	50	SFVSCY 50

Tolerance  $\pm$  as per given general data in vessel chapter.



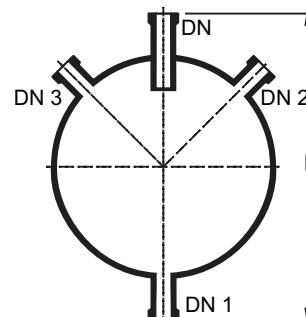
## VESSELS & STIRRERS

### SPHERICAL RECEIVERS

Receivers are provided with built-in dip pipe.

Nominal Cap.Ltr.	L	DN	DN1	10° DN2	10° DN3	Reference
5 L	350	25	25	25	-	SFVR 5
10 L	425	25	25	25	-	SFVR 10
20 L	500	25	25	25	-	SFVR 20
5 L	350	25	25	25	25	SFVRB 5
10 L	425	25	25	25	25	SFVRB 10
20 L	500	25	25	25	25	SFVRB 20

Tolerance ± as per given general data in vessel chapter.

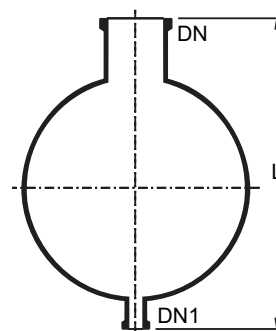


### ADDITION VESSELS

These vessels are provided with a short bottom outlet. It should be supported on a vessel holder/holding ring.

Nominal Cap.Ltr.	L	DN	DN1	Reference
5 L	375	40	25	SFVA 5
10 L	450	40	25	SFVA 10
20 L	525	80	25	SFVA 20
50 L	725	100	40	SFVA 50
100 L	825	150	40	SFVA 100
200 L	1075	225	40	SFVA 200
300 L	1125	300	50	SFVA 300

Tolerance ± as per given general data in vessel chapter.

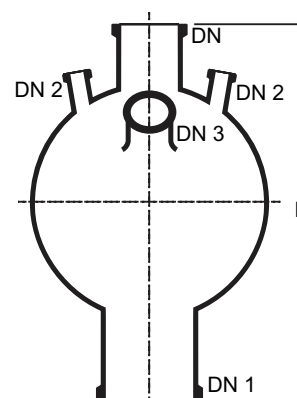


### SPHERICAL VESSELS WITH WIDE BOTTOM OUTLET

These vessel are used to fit immersion heat exchangers in the bottom.

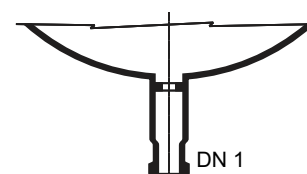
Nominal Cap.Ltr.	L	DN	DN1	DN2	DN3	Reference
50 L	800	100	150	40	100	SFVSR 50
100 L	900	150	150	40	100	SFVSR 100
200 L	1150	225	150	40	100	SFVSR 200
50 L	850	100	225	40	100	SFVSE 50
100 L	950	150	225	40	100	SFVSE 100
200 L	1200	225	225	40	100	SFVSE 200

Tolerance ± as per given general data in vessel chapter.



### VESSELS WITH FLUSH BOTTOM OUTLET VALVE SEAT

We can provide you with seat arrangement to fit flush bottom outlet valve. This will eliminate accumulation of unreacted solids & liquids in dead space of the reactor outlet area. If you require the same; add suffix "/B" to the catalogue reference no of the vessel. For e.g. "SFVS50" required with flush bottom outlet valve seat will be called "SFVS50/B".



# VESSELS & STIRRERS

## CYLINDRICAL VESSELS

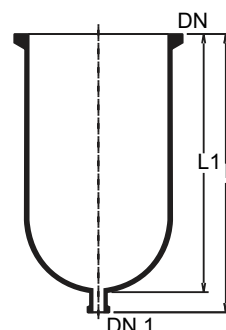
Cylindrical vessels can be used as stirred reaction vessel, separator vessels & receivers or feed vessels. 50 lt. & above cylindrical vessels need to be supported in a vessel holder. Cylindrical vessels of smaller capacity can be supported by upper flange. These vessels can also be provided with valve seat in outlet nozzle for flush bottom outlet valve fixing.

## UNIVERSAL CYLINDRICAL VESSELS

These vessel are used mainly as agitated vessel with suitable top covers & drive systems.

Nominal Cap. Ltr.	DN	DN1	L	L1	Reference
5 L	150	25	460	400	SFVZ 5/6
10 L	225	25	550	450	SFVZ 10/9
20 L	300	25	500	440	SFVZ 20/12
30 L	300	40	650	585	SFVZ 30/12
50 L	300	40	900	835	SFVZ 50/12
100 L	450	40	890	825	SFVZ 100/18
150 L	450	40	1195	1130	SFVZ 150/18
200 L	450	40	1500	1435	SFVZ 200/18
300 L	600	50	1300	1125	SFVZ 300/24

Tolerance  $\pm$  as per given general data in vessel chapter.

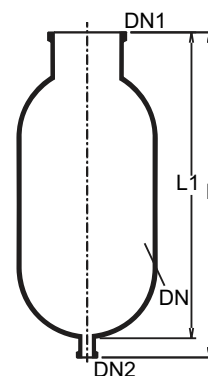


## CYLINDRICAL RECEIVERS

Cylindrical receivers with a reduced diameter top neck provide an economical alternative as they require a smaller vessel cover. These vessels are mainly used as receivers or feed vessels.

Nominal Cap. Ltr.	DN	DN1	DN2	L	L1	Reference
20 L	300	150	25	650	590	SFVZR 20/6
30 L	300	150	40	800	735	SFVZR 30/6
50 L	300	150	40	1000	935	SFVZR 50/6
100 L	450	225	40	1100	1035	SFVZR 100/9
150 L	450	225	40	1400	1335	SFVZR 150/9
200 L	450	225	40	1625	1560	SFVZR 200/9
300 L	600	225	50	1500	1425	SFVZR 300/9

Tolerance  $\pm$  as per given general data in vessel chapter.

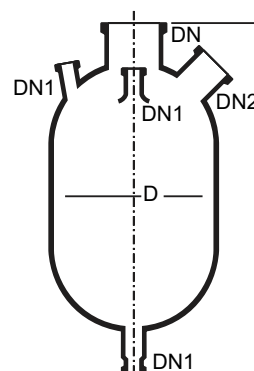


## CYLINDRICAL VESSELS - REACTOR

Cylindrical reactor vessels are useful as agitated reaction vessels in pilot & small-scale production activity. They can be provided with flush bottom outlet nozzle

Nominal Cap. Ltr.	D	DN	DN1	DN2 45 DEG.	L	Reference
5 L	200	50	25	40	475	SFVCY 5
10 L	220	50	25	40	600	SFVCY 10
20 L	300	80	25	50	650	SFVCY 20
30 L	300	80	25	50	790	SFVCY 30
50 L	420	100	40	100	795	SFVCY 50
100 L	500	150	40	100	1020	SFVCY 100
150 L	500	150	40	100	1315	SFVCY 150
200 L	600	225	40	100	1190	SFVCY 200
300 L	600	225	40	100	1590	SFVCY 300
400 L	650	300	40	100	1715	SFVCY 400

Tolerance  $\pm$  as per given general data in vessel chapter.



## VESSELS & STIRRERS

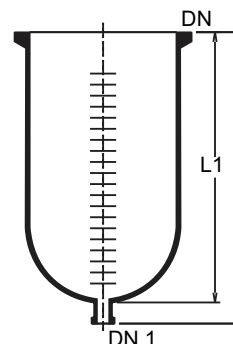
### GRADUATED CYLINDRICAL VESSELS

Cylindrical vessels can be provided with standard graduation. Special graduation as per your specific requirement can also be provided.

### UNIVERSAL CYLINDRICAL VESSELS

Nominal Cap. Ltr.	DN	DN1	L	L1	Reference
5 L	150	25	460	400	SFVZG 5/6
10 L	225	25	550	450	SFVZG 10/9
20 L	300	25	500	440	SFVZG 20/12
30 L	300	40	650	585	SFVZG 30/12
50 L	300	40	900	835	SFVZG 50/12
100 L	450	40	890	825	SFVZG 100/18
150 L	450	40	1195	1130	SFVZG 150/18
200 L	450	40	1500	1435	SFVZG 200/18
300 L	600	50	1300	1125	SFVZG 300/24

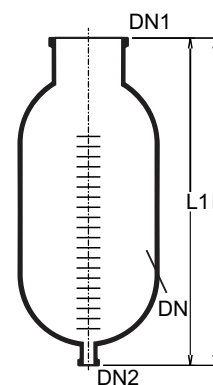
Tolerance  $\pm$  as per given general data in vessel chapter.



### CYLINDRICAL RECEIVERS

Nominal Cap. Ltr.	DN	DN1	DN2	L	L1	Reference
20 L	300	150	25	650	590	SFVZRG 20/6
30 L	300	150	40	800	735	SFVZRG 30/6
50 L	300	150	40	1000	935	SFVZRG 50/6
100 L	450	225	40	1100	1035	SFVZRG 100/9
150 L	450	225	40	1400	1335	SFVZRG 150/9
200 L	450	225	40	1625	1560	SFVZRG 200/9
300 L	600	225	50	1500	1425	SFVZRG 300/9

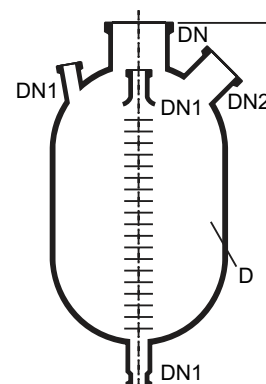
Tolerance  $\pm$  as per given general data in vessel chapter.



### CYLINDRICAL VESSELS - REACTOR

Nominal Cap. Ltr.	D	DN	DN1	DN2 45 DEG.	L	Reference
5 L	200	50	25	40	475	SFVCYG 5
10 L	220	50	25	40	600	SFVCYG 10
20 L	300	80	25	50	650	SFVCYG 20
30 L	300	80	25	50	790	SFVCYG 30
50 L	420	100	40	100	795	SFVCYG 50
100 L	500	150	40	100	1020	SFVCYG 100
150 L	500	150	40	100	1315	SFVCYG 150
200 L	600	225	40	100	1190	SFVCYG 200
300 L	600	225	40	100	1590	SFVCYG 300
400 L	650	300	40	100	1715	SFVCYG 400

Tolerance  $\pm$  as per given general data in vessel chapter.



# VESSELS & STIRRERS

## MOBILE VESSELS

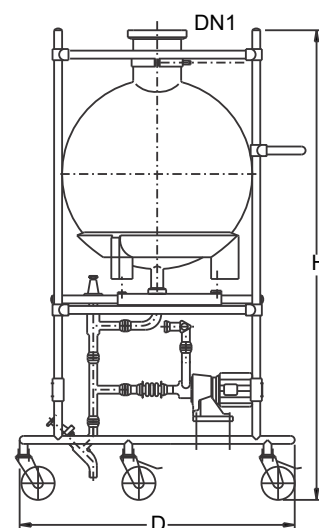
Mobile vessels are ideal for a wide range of application in the laboratory, pilot and for small scale production. They reduce the need for investment in permanent installation and also reduce the pressure and temperature losses resulting from pipeline installations.

These units are available with spherical vessels from 50 to 300 liters in capacity with cylindrical vessels from 20 to 300 liters in capacity. Cylindrical vessels can be graduated if required. Mobile vessels can be supplied with or without centrifugal pump. Without a pump, the units are supplied with a DN 40 drain valve. With pump, the units incorporate a DN 25 drain valve and a DN 25 and DN 15 angle valve on either side of the pump.

Each mobile vessel trolley has two lockable steering castor and two steering castors to enable maximum manoeuvrability.

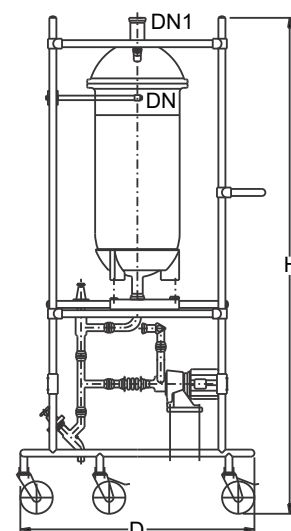
## MOBILE SPHERICAL VESSELS

Nominal capacity(l)	DN1	D	H	Reference without pump	Reference with pump
50	225	962	1317	SFVF 50	SFVFP 50
100	225	962	1470	SFVF 100	SFVFP 100
200	300	1245	1700	SFVF 200	SFVFP 200



## MOBILE CYLINDRICAL VESSELS

Nominal capacity(l)	DN	DN1	D	H	Reference without pump	Reference with pump
30	300	50	821	1545	SFVGF 30	SFVGP 30
50	300	50	821	1795	SFVGF 50	SFVGP 50
100	450	50	962	1945	SFVGF 100	SFVGP 100
150	450	50	962	2245	SFVGF 150	SFVGP 150
200	450	50	962	2545	SFVGF 200	SFVGP 200

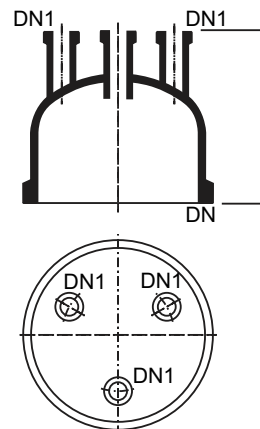


## VESSELS & STIRRERS

### CYLINDRICAL VESSEL COVERS

These covers provide vacuum tight closures for vessels & facility for fitting of stirrer, measuring instrument, dip pipe & vapor outlet.

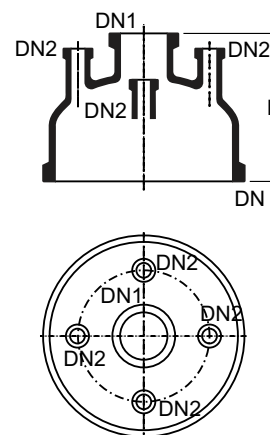
DN	DN1	L	Reference
150	40 x 3	215	SFVZA 6/1.5
225	40 x 3	240	SFVZA 9/1.5



### CYLINDRICAL VESSEL COVERS WITH CENTRE BRANCH

The centre branch on these vessels covers is generally used in conjunction with stirrer.

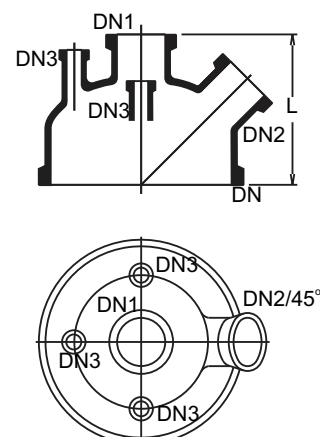
DN	DN1	DN2	L	Reference
150	50	25 x 2	250	SFVZA 6/2
225	80	25 x 4	280	SFVZA 9/3
300	80	40 x 4	325	SFVZA 12/3
400	100	40 x 4	400	SFVZA 16/4
450	150	40 x 4	350	SFVZA 18/6
600	150	40 x 4	400	SFVZA 24/6



### CYLINDRICAL VESSEL COVERS WITH CENTRE BRANCH & SIDE NOZZLE (45°)

This Vessel cover is supplied with one large side nozzle at 45° for vapour outlet.

DN	DN1	DN2 45°	DN3	L	Reference
225	80	80	25 x 3	280	SFVZA 9/3
300	80	80	40 x 3	325	SFVZA 12/3
400	100	100	40 x 3	400	SFVZA 16/4
450	150	100	40 x 3	400	SFVZA 18/6
600	150	100	40 x 3	400	SFVZA 24/6

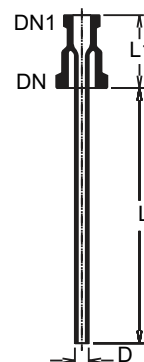


# VESSELS & STIRRERS

## DIP PIPES

Dip pipes are used to feed material in the vessel below the liquid

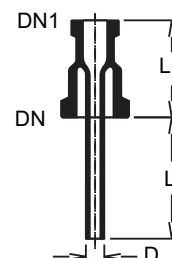
VESSEL Cap. Ltr.	DN	DN1	D	L	L1	Reference
5 L	25	25	12	150	100	SFDP 5/1
10 L	25	25	12	200	100	SFDP 10/1
20 L	25	25	12	300	100	SFDP 20/1
50 L	40	25	19	380	100	SFDP 50/1.5
100 L	40	25	19	480	100	SFDP 100/1.5
200 L	40	25	19	580	100	SFDP 200/1.5
300 L	40	25	19	680	100	SFDP 300/1.5



## SHORT DIP PIPES

Short dip pipes are used as re-entry tubes for vessel above the liquid level.

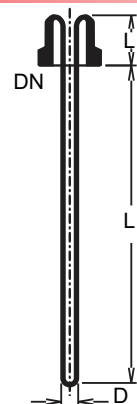
DN	DN1	D	L	L1	Reference
25	25	12	100	100	SFDP 1/1
40	25	19	100	100	SFDP 1.5/1
40	40	19	100	100	SFDP 1.5/1.5
50	25	25	100	100	SFDP 2/1
50	40	25	100	100	SFDP 2/1.5
80	40	38	100	125	SFDP 3/1.5
100	25	25	100	150	SFDP 4/1
100	50	50	100	150	SFDP 4/2
150	40	40	100	200	SFDP 6/1.5
150	50	50	100	200	SFDP 6/2



## THERMOMETER POCKETS

They are used to monitor temperature of the system with help of thermometer. For short response time & accuracy a right heat transfer fluid can be used.

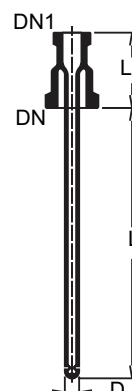
VESSEL Cap. Ltr.	DN	D	L	L1	Reference
5 L	25	12	150	50	SFTP 5/1
10 L	25	12	200	50	SFTP 10/1
20 L	25	12	300	50	SFTP 20/1
50 L	40	19	380	50	SFTP 50/1.5
100 L	40	19	480	50	SFTP 100/1.5
200 L	40	19	580	50	SFTP 200/1.5
300 L	40	19	680	50	SFTP 300/1.5



## GAS SPARGERS

They are used for gas sparging in directly in to the liquids in the vessel.

VESSEL Cap. Ltr.	DN	DN1	D	L	L1	No.of Holes	Reference
20 L	25	25	12	300	100	5x1mm	SFSPG 20/1
50 L	40	25	19	400	100	5x1mm	SFSPG 50/1.5
100 L	40	25	19	500	100	5x1mm	SFSPG 100/1.5
200 L	40	25	19	600	100	5x1mm	SFSPG 200/1.5
300 L	40	25	19	700	100	5x1mm	SFSPG 300/1.5



## VESSELS & STIRRERS

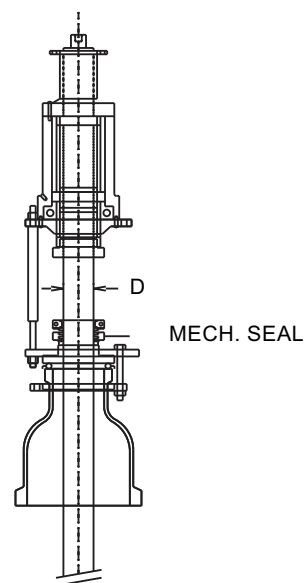
### STIRRER SYSTEMS

A wide variety of stirrers and drives are available to use glass vessels as agitated reaction system. They generally comprise of two components; agitator & drive unit including chuck & seal. A reducer or vessel cover is required to connect the top neck of the vessel to drive unit. Variable speed drives can also be supplied on request.

### CHUCK & SEAL

Chuck & seal assembly mainly consist of Chuck, bellow seal or mechanical seal, Glass seal plate or ceramic seal plate, clamping plate, flexible shaft, stud etc. This assembly prohibits contact of process fluids with anything other than agitator or seal components, which are inert to corrosion. Bellow seals can be used for vacuum up to 10 mm Hg. Mechanical seal should be used for vacuum up to 1 mm Hg & for higher than atmospheric pressure up to the permissible operating limits of the glass vessels. For GMP application SS304 or SS316 chuck&seal can also be supplied.

Vessel Cap. Ltr.	DN	D	Reference Bellow Seal	Reference Mech. Seal
10 L	50	24.5	SFCSA 1	SFCSM 1
20 L	50	24.5	SFCSA 1	SFCSM 1
50 L	50	24.5	SFCSA 1	SFCSM 1
100 L	80	45.5	SFCSA 1.5	SFCSM 1.5
200 L	80	45.5	SFCSA 1.5	SFCSM 1.5
300 L	80	45.5	SFCSA 1.5	SFCSM 1.5



### GLASS STIRRER WITH PTFE BLADE.

These stirrers are suitable for agitating liquids with low viscosity.

Vessel Cap. Ltr.	d	D	L	L1	L2	Reference
5 L	24.5	40	625	350	25	SFSTB 5
10 L	24.5	40	700	350	25	SFSTB 10
20 L	24.5	70	800	350	25	SFSTB 20
50 L	24.5	90	1000	350	25	SFSTB 50
100 L	45.5	140	1200	375	30	SFSTB 100
200 L	45.5	170	1400	400	30	SFSTB 200
300 L	45.5	170	1500	400	30	SFSTB 300

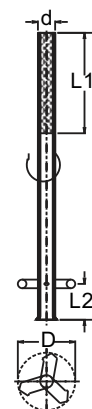


# VESSELS & STIRRERS

## VORTEX STIRRER

These stirrers are suitable for agitating liquids with low viscosity containing small quantity of solid particles.

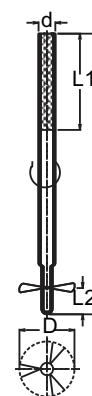
Vessel Cap. Ltr.	d	D	L	L1	L2	Reference
5 L	24.5	40	625	350	50	SFSTV 5
10 L	24.5	40	700	350	50	SFSTV 10
20 L	24.5	50	800	350	50	SFSTV 20
50 L	24.5	65	1000	350	65	SFSTV 50
100 L	45.5	65	1200	375	65	SFSTV 100
200 L	45.5	105	1400	400	65	SFSTV 200
300 L	45.5	105	1500	400	65	SFSTV 300



## PROPELLER STIRRER

These stirrers are suitable for agitating liquids with high viscosity containing large quantity of solid particles.

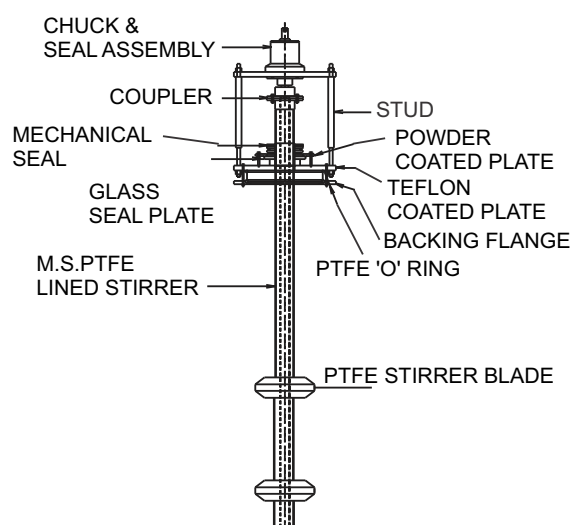
Vessel Cap. Ltr.	d	D	L	L1	L2	Reference
5 L	24.5	40	625	350	50	SFSTP 5
10 L	24.5	40	700	350	50	SFSTP 10
20 L	24.5	50	800	350	50	SFSTP 20
50 L	24.5	65	1000	350	65	SFSTP 50
100 L	45.5	65	1200	375	65	SFSTP 100
200 L	45.5	105	1400	400	65	SFSTP 200
300 L	45.5	105	1500	400	65	SFSTP 300



## M.S. PTFE LINED STIRRER

These stirrers are useful in providing high agitation of liquids with high viscosity containing large quantity of solid particles in the complete reactor.

- M.S. PTFE Lined Stirrer
- Chuck and Mechanical Seal
- Teflon Coated Plate
- PTFE Impeller

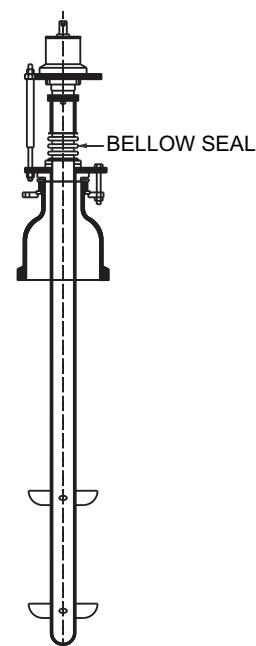


## VESSELS & STIRRERS

### DRIVE UNIT FOR GLASS STIRRER WITH BELLOW SEAL

This unit consists of [a] glass agitator, [b] chuck & bellow seal with suitable [c] reducer for fitting the drive assembly on the vessel.

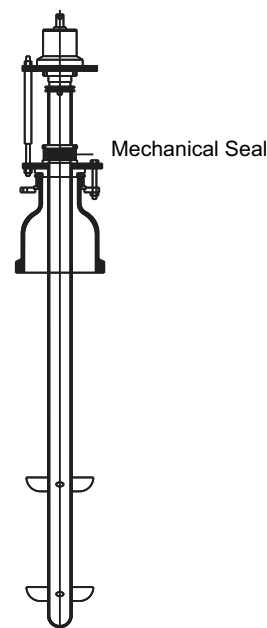
Vessel Cap. Ltr.	Stirrer Used	Chuck & Seal Used	Reducer Used	Reference
10 L	SFSTB 10	SFCSA 1	-	SFSTBA 10
20 L	SFSTB 20	SFCSA 1	SFPR 3/2	SFSTBA 20
50 L	SFSTB 50	SFCSA 1	SFPR 4/2	SFSTBA 50
100 L	SFSTB 100	SFCSA 1.5	SFPR 6/3	SFSTBA 100
200 L	SFSTB 200	SFCSA 1.5	SFPR 9/3	SFSTBA 200
300 L	SFSTB 300	SFCSA 1.5	SFPR 12/3	SFSTBA 300
10 L	SFSTV 10	SFCSA 1	-	SFSTVA 10
20 L	SFSTV 20	SFCSA 1	SFPR 3/2	SFSTVA 20
50 L	SFSTV 50	SFCSA 1	SFPR 4/2	SFSTVA 50
100 L	SFSTV 100	SFCSA 1.5	SFPR 6/3	SFSTVA 100
200 L	SFSTV 200	SFCSA 1.5	SFPR 9/3	SFSTVA 200
300 L	SFSTV 300	SFCSA 1.5	SFPR 12/3	SFSTVA 300
10 L	SFSTP 10	SFCSA 1	-	SFSTPA 10
20 L	SFSTP 20	SFCSA 1	SFPR 3/2	SFSTPA 20
50 L	SFSTP 50	SFCSA 1	SFPR 4/2	SFSTPA 50
100 L	SFSTP 100	SFCSA 1.5	SFPR 6/3	SFSTPA 100
200 L	SFSTP 200	SFCSA 1.5	SFPR 9/3	SFSTPA 200
300 L	SFSTP 300	SFCSA 1.5	SFPR 12/3	SFSTPA 300



### DRIVE ASSEMBLY FOR GLASS STIRRERS WITH MECHANICAL SEAL

This unit consists of [a] glass agitator, [b] chuck & mechanical seal with suitable [c] reducer for fitting the drive assembly on the vessel.

Vessel Cap. Ltr.	Stirrer Used	Chuck & Seal Used	Reducer Used	Reference
10 L	SFSTB 10	SFCSA 1	-	SFSTBM 10
20 L	SFSTB 20	SFCSA 1	SFPR 3/2	SFSTBM 20
50 L	SFSTB 50	SFCSA 1	SFPR 4/2	SFSTBM 50
100 L	SFSTB 100	SFCSA 1.5	SFPR 6/3	SFSTBM 100
200 L	SFSTB 200	SFCSA 1.5	SFPR 9/3	SFSTBM 200
300 L	SFSTB 300	SFCSA 1.5	SFPR 12/3	SFSTBM 300
10 L	SFSTV 10	SFCSA 1	-	SFSTVM 10
20 L	SFSTV 20	SFCSA 1	SFPR 3/2	SFSTVM 20
50 L	SFSTV 50	SFCSA 1	SFPR 4/2	SFSTVM 50
100 L	SFSTV 100	SFCSA 1.5	SFPR 6/3	SFSTVM 100
200 L	SFSTV 200	SFCSA 1.5	SFPR 9/3	SFSTVM 200
300 L	SFSTV 300	SFCSA 1.5	SFPR 12/3	SFSTVM 300
10 L	SFSTP 10	SFCSA 1	-	SFSTPM 10
20 L	SFSTP 20	SFCSA 1	SFPR 3/2	SFSTPM 20
50 L	SFSTP 50	SFCSA 1	SFPR 4/2	SFSTPM 50
100 L	SFSTP 100	SFCSA 1.5	SFPR 6/3	SFSTPM 100
200 L	SFSTP 200	SFCSA 1.5	SFPR 9/3	SFSTPM 200
300 L	SFSTP 300	SFCSA 1.5	SFPR 12/3	SFSTPM 300

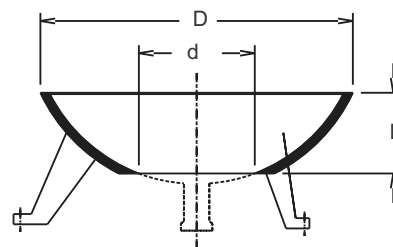


# VESSELS & STIRRERS

## VESSEL HOLDERS

Vessel holders are made of cast aluminum with a plaster lining shaped to accommodate the vessel. It is supported with three bolts.

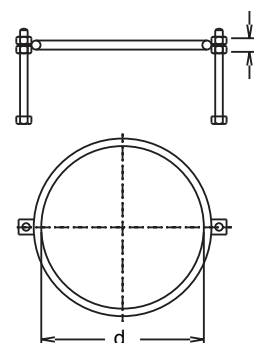
Vessel Cap. Ltr.	D	d	L	Reference
10 L	300	220	100	SFVSS 10
20 L	325	230	100	SFVSS 20
30 L	350	230	100	SFVSS 30
50 L	390	230	100	SFVSS 50
100 L	410	250	100	SFVSS 100
200 L	700	400	215	SFVSS 200
300 L	900	500	250	SFVSS 300



## VESSEL HOLDING RINGS

vessel holders rings are wrapped with asbestos rope and are to be supported with four bolts.

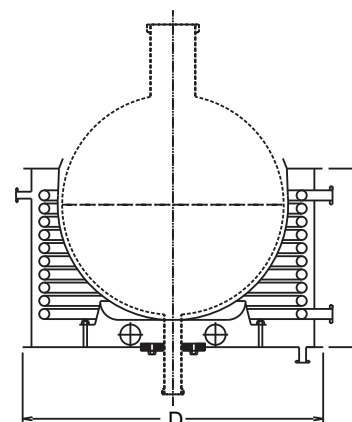
Vessel Cap. Ltr.	d	L	Reference
2 L	100	15	SFVRS 2
5 L	150	15	SFVRS 5
10 L	215	15	SFVRS 10
20 L	300	15	SFVRS 20



## HEATING BATHS WITH COIL & HEATER

Heating baths are used for electrical steam heating of glass vessel Depending on the temperature requirements, water or suitable thermic fluid can be used as media. They are provided with a pair of non flame proof heaters with control box & a coil for passing the steam or cooling water. It is also fitted with bottom outlet sealing arrangement, cushioned vessel holder, a lid & threaded socket or flange type inlet & outlet nozzles. Specially designed flame proof bath are also available on request. For GMP application SS304 or SS316 baths are available. Baths for cylindrical vessels can also be supplied.

Vessel Cap. Ltr.	D	L	Loading KW	Reference
5 L	325	225	2 (2x1000)	SFSBH 5
10 L	350	250	2 (2x1000)	SFSBH 10
20 L	480	330	3 (3x1000)	SFSBH 20
50 L	615	415	4.5(3x1500)	SFSBH 50
100 L	720	510	6 (3x2000)	SFSBH 100
200 L	900	620	9 (3x3000)	SFSBH 200

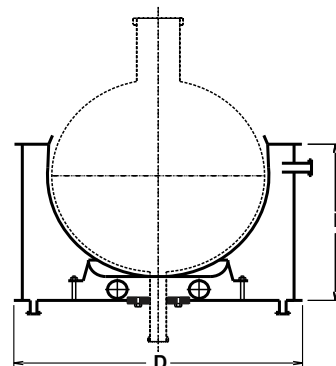


## VESSELS & STIRRERS

### COOLING BATHS

Cooling baths are used for cooling the glass vessel with ice crystals. Cooling baths are provided with vessel holding ring, bottom outlet sealing arrangement & a lid.

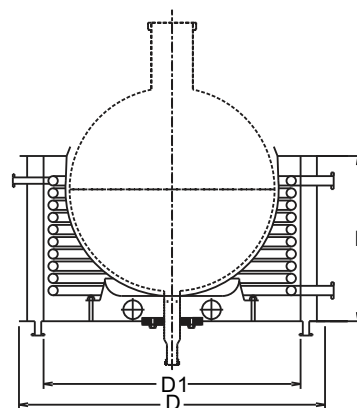
Vessel Cap.(Ltr.)	D	L	Reference
5 L	325	225	SFBHC 5
10 L	350	250	SFBHC 10
20 L	480	330	SFBHC 20
50 L	615	415	SFBHC 50
100 L	720	510	SFBHC 100
200 L	900	620	SFBHC 200



### HEATING BATHS JACKETED WITH COIL

This bath is used when glass vessel is to be heated and cooled frequently. Coil & jacket are connected to heating media & cooling media simultaneously. Electrical heater can also be provided on request.

Vessel Cap.(Ltr.)	D1	D	L	Reference
5 L	325	395	260	SFBHD 5
10 L	350	420	285	SFBHD 10
20 L	480	550	365	SFBHD 20
50 L	635	685	465	SFBHD 50
100 L	730	830	560	SFBHD 100
200 L	900	1050	680	SFBHD 200

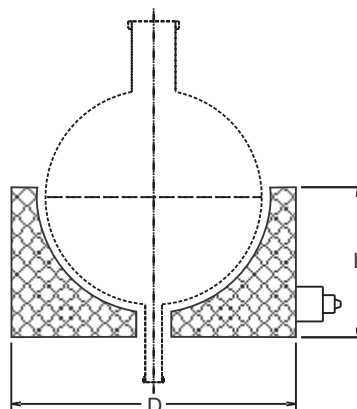


### HEATING MANTLES

Heating mantles are used for electrical heating of glass vessel. They are subdivided into several heating zones each of which can be controlled independently depending on the liquid level in vessel.

Vessel Cap.(Ltr.)	D	L	Watts	Circuits	Supply Volts	Reference
5 L	320	190	750	2	230	SFJMD 5
10 L	380	220	1200	2	230	SFJMD 10
20 L	485	285	2000	3	230	SFJMD 20
50 L	600	345	3700	3	415	SFJMD 50
100 L	790	470	6000	3	415	SFJMD 100
200 L	920	530	7500	6	415	SFJMD 200

Vessel Cap.(Ltr.)	D	L	Watts	Circuits	Supply Volts	Reference
5 L	330	200	600	1	230	SFJMD 5/F
10 L	440	220	1000	1	230	SFJMD 10/F
20 L	510	285	2000	2	230	SFJMD 20/F
50 L	610	350	3600	3	415	SFJMD 50/F
100 L	790	430	5200	3	415	SFJMD 100/F
200 L	940	510	8400	3	415	SFJMD 200/F

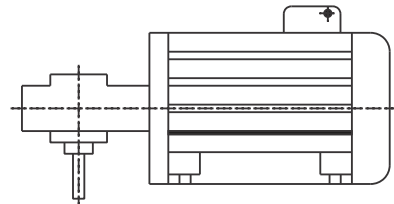


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## STIRRER DRIVES

A 1400 RPM 3 phase non-flameproof motor with built in gear box is supplied with flexible shaft. A coupling to couple flexible shaft to motor is also provided. Other end of the flexible shaft is to be attached to chuck.

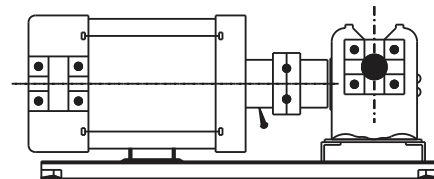
H.P.	RPM	Reference
0.5	192	STRSD.5



## FLAMEPROOF STIRRER DRIVES

A 1400 RPM 3 phase flameproof motor with built in gear box is supplied with flexible shaft. A coupling to couple flexible shaft to motor is also provided. Other end of the flexible shaft is to be attached to chuck. Motor is mounted on a metal frame which is designed to install easily with a glass assembly.

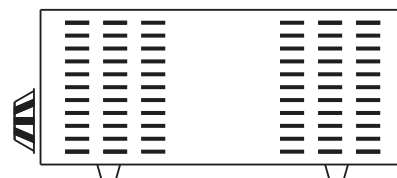
H.P.	RPM	Reference
0.5	192	STRSD.5



## SPEED REGULATORS

3 phase non-flameproof regulators are available to control the speed of stirrer

Phase	Reference
3	STRG 3



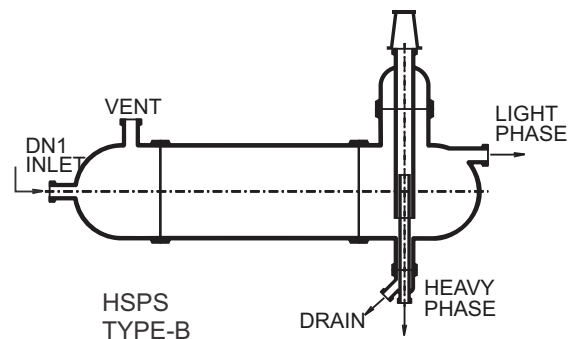
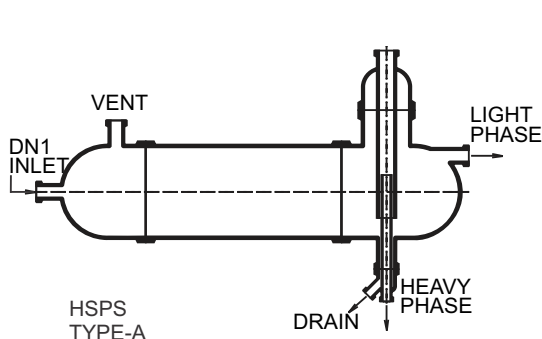
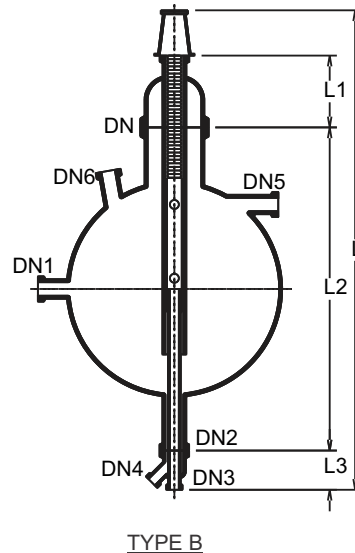
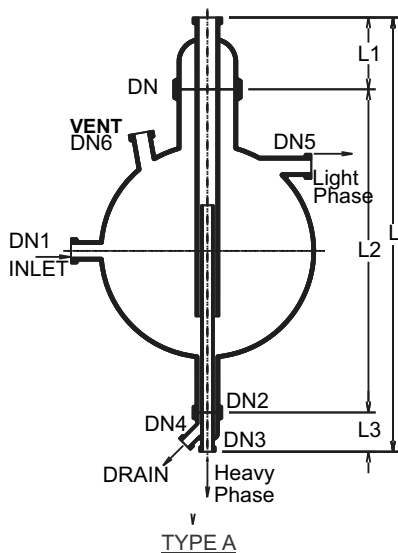
## VESSELS & STIRRERS

### SEPARATORS

Separators are used to settle two immiscible liquids with different densities. When this mixture of liquids is allowed to settle, two separate layers are formed. Mixture of liquid is continuously feeded in separator at low velocity. This allow sufficient residence time for the formation of separating layers. Light phase liquid is continuously removed from light phase outlet at the top. The Heavy phase liquid enters through dip pipe at lower end and over flows in the discharge pipe and is removed from the bottom outlet.

Separator can be provided with adjustable overflow valve, (Type B) to adjust position of interface for different operating situations. Separator can also be constructed with horizontal cylindrical vessel and to provide larger-separating surface. (Cat Ref. HSPS Or HSPA).

Nominal Cap.	DN	Inlet DN1	DN2	Heavy Phase Outlet DN3	Drain DN4	Light Phase Outlet DN5	Vent DN6	L	L1	L2	L3	Type	Reference
20 L	80	25	50	25	25	25	25	800	125	525	-	A	SFSPS 20
50 L	100	40	50	25	25	40	40	1025	150	725	-	A	SFSPS 50
100 L	150	40	50	25	25	40	40	1175	200	825	-	A	SFSPS 100
200 L	225	40	50	25	25	40	40	1475	250	1075	-	A	SFSPS 200
20 L	80	25	50	25	25	25	25	1000	125	525	200	B	SFSPA 20
50 L	100	40	50	25	25	40	40	1225	150	725	200	B	SFSPA 50
100 L	150	40	50	25	25	40	40	1375	200	825	200	B	SFSPA 100
200 L	225	40	50	25	25	40	40	1675	250	1075	200	B	SFSPA 200



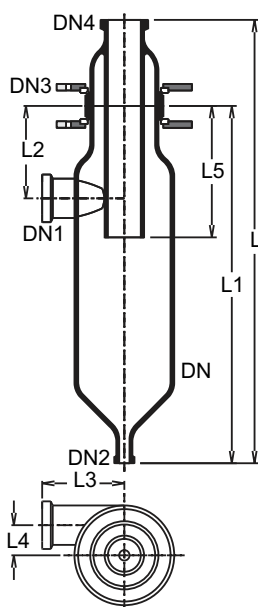
# VESSELS & STIRRERS

## CYCLONES

Cyclones are designed for separation not only for droplets from gases and vapours, but also for particulate solids from gases. The overall degree of separation can be as high as 99% but this figure is governed to a large extent by the following factors.

- Liquid loading of the gas or vapour or solids loading of the gas.
- Droplet or particle size range.
- Droplet or particle size distribution.

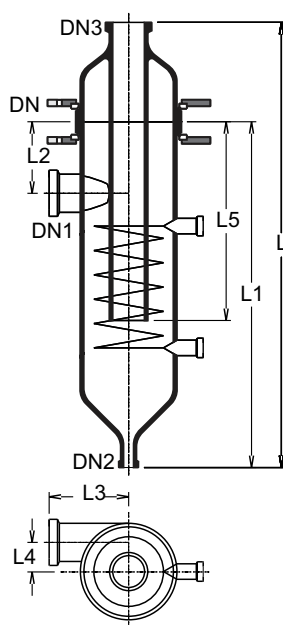
DN	DN1	DN2	DN3	DN4	L	L1	L2	L3	L4	L5	Reference
100	40	25	80	40	715	560	130	125	35	180	SFCY 4
150	50	25	100	50	850	665	165	150	55	235	SFCY 6
225	80	25	150	80	1120	870	225	200	75	320	SFCY 9
300	100	25	150	100	1430	1115	285	275	100	405	SFCY 12



## VESSELS & STIRRERS

### CYCLONES WITH INTERNAL COOLING COIL

DN	DN1	DN2	DN3	L	L1	L2	L3	L4	L5	Reference
100	40	25	40	715	560	130	125	35	330	SFCY 4
150	50	25	50	850	665	165	150	55	375	SFCY 6
225	80	25	80	1120	870	180	200	75	500	SFCY 9
300	100	25	100	1430	1155	215	275	100	675	SFCY 12



# SIGFOLDI-JACKET<sup>TM</sup>



## INTRODUCTION

SIGFOLDI – JACKET<sup>TM</sup> is manufactured using borosilicate glass with 3.3 coefficient of expansion. They have proved their worth to Excellent effect through out the chemical and pharmaceutical industries as well as many related areas such as food and drink production. For special applications, cylindrical vessels can be supplied with a jacket for heating or cooling.

Up to a nominal capacity of 200L (First time in world) SIGFOLDI-JACKET<sup>TM</sup> with full bore diameter, top branch can also supplied with a borosilicate glass 3.3 jacket In the SIGFOLDI-JACKET<sup>TM</sup> flexible seal is used on the upper end and bottom outlet branch with special designed CI/M.S./S.S Flanges. Which design is Registered.



## SIGFOLDI-JACKET™

### APPLICATION

- \* Crystallisation
- \* Extraction
- \* Distillation / Rectification
- \* Phase separation of azeotropic mixtures
- \* Multi – component reactions.

### ADVANTAGE

- \* 100% Folding design with designed Registration.
- \* Easy replacement of any parts of vessel
- \* Lesser breakage due to thermal shock
- \* Due to both ends flexible seal absorbs the different expansion levels and prevents high stresses of the inner component and the jacket by allowing the movement flexibility between two due to thermal expansion.
- \* Easy to repair any part of vessel.
- \* Easy to clean & handle during the cleaning
- \* Compact design
- \* Highly corrosion resistant materials : Glass / PTFE / Neoprene Rubber

Due to their design, Jacketed vessels should be supported on the top neck flange using tubular support frames.  
If jacketed cylindrical vessels require valve seat in order to fit a BAL 40 bottom outlet valve.

### TECHNICAL INFORMATION

- \* Water or heat transfer fluids can be used for heat transfer purpose.
- \* The branches on the jacket are of the **sigma flat, buttress end** type. If they are aligned horizontally and if long or heavy hoses are connected to them, we recommended 90° hose connectors to reduce the bending moment on the branches.
- \* The permissible operating pressures for the inner part of jacketed

CAPACITY	Op.pres.for inner part (BAR g)
5 ltr./150mm	2.0
10 ltr./150mm	2.0
20 ltr./300mm	1.0
25 ltr./300mm	1.0
30 ltr./300mm	1.0
50 ltr./300mm	1.0
100 ltr./400mm	0.7
200 ltr./450mm	0.5

The permanently flexible seals are used on the both end which absorbs the different expansion levels and prevents high stresses of the inner component and the jacket by allowing the movement flexibility between two due to thermal expansion, but does not have the high temperature resistance and strength of borosilicate glass.

### Permissible operating temperature.

As per high safety factor, Glass Jacket can be used for a maximum operating temperature of -40°C to 150°C in Jacket.

The temperature difference between Jacket & Vessel should not be exceed than 120°C.

### Permissible operating pressure

The maximum permissible operating pressure in the jacket is +0.5 bar g up. To an overall heat transfer coefficient of  $u = 70 \text{ W/m}^2\text{K}$ . This average value can be expected during a heating process with thermal oil in the jacket and stirred liquid the vessel.

Nominal Capacity	DN	Reference
05 Ltr.	150	SFSFJ-5L/150
10 Ltr.	150	SFSFJ-10L/150
20 Ltr.	300	SFSFJ-20L/300
25 Ltr.	300	SFSFJ-25L/300
30 Ltr.	300	SFSFJ-30L/300
50 Ltr.	300	SFSFJ-50L/300
100 Ltr.	400	SFSFJ-100L/400
200 Ltr.	450	SFSFJ-200L/450

# HEAT EXCHANGERS



## INTRODUCTION

SIGMA heat exchangers provide optimum solution for all requirements encountered because of the wide range of heat exchangers available. This is as coil type heat exchangers, which are available as condensers, boilers and immersion heat exchangers and shell, & tube type heat exchangers, which are designed for use with tubes in widest possible range of corrosion resistant materials. The complete range of standard heat exchangers is described on following pages. Non-standard components can also be supplied as per your requirements.

# HEAT EXCHANGERS

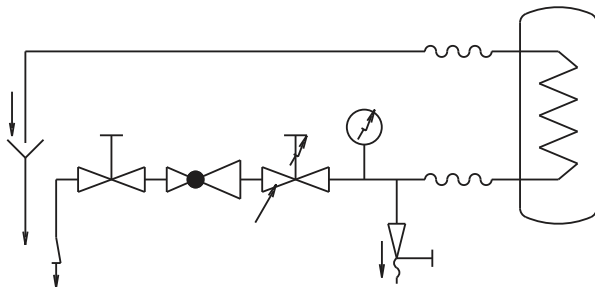
## COIL TYPE HEAT EXCHANGERS

Coil type heat exchangers are all glass design where coil battery is welded directly to glass jacket. This is of importance for plants which have to confirm to GMP requirements since it ensures that product & coolants cannot come in contact with each other. Coil type heat exchangers are mainly used as condensers or coolers. They can also be used for heat transfer between liquids & gases. Turbulent flow is ensured even in large bore heat exchangers since coil layers are offset & fill the flow cross section to great extent.

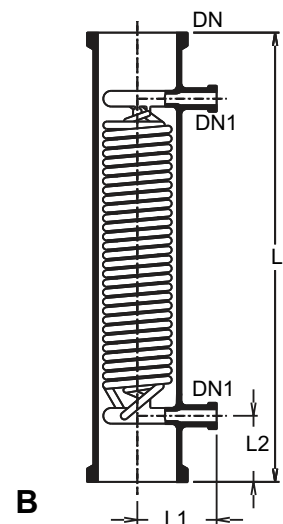
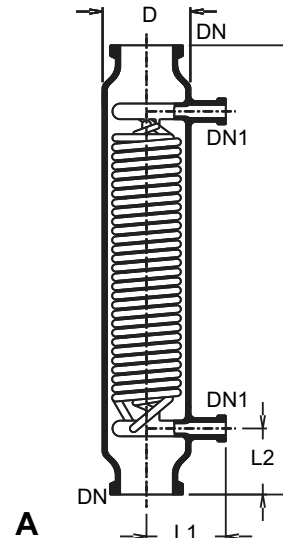
Following points should be taken in account while using coil type heat exchangers.

1. When connecting coolant lines to coil type condensers; flexible hose or bellow should be used to avoid transfer of stresses to the glass
2. Use of steam in coil should be avoided.
3. Coolant should not be allowed to be heated up to boiling point.
4. Coolant control valve should be turned on slowly particularly when air is present in the coils.
5. Complete drain of coolant should be allowed.
6. Brine can be used in coil in close circuit with suitable precaution against water hammering.
7. Vapour should be passed through shell only.
8. Maximum pressure of coolant should be 2.7 bar
9. Freezing of water in the coil should be avoided.
10. Condensers should preferably be mounted in vertical position.
11. Heat exchangers should be mounted in series to provide large surface area.

### Typical Heat Exchanger Arrangement



Area (m <sup>2</sup> )	DN	DN1	L	L1	Type	Reference
0,2	40	16	600	100	A	SFHE1.5/2
0,3	50	16	600	100	A	SFHE2/3
0,35	80	16	600	100	B	SFHE3/3.5
0,5	100	19	600	100	B	SFHE4/5
0,6	100	19	750	100	B	SFHE4/6
1,0	150	25	600	100	C	SFHE6/10
1,5	150	25	850	100	C	SFHE6/15
2,5	225	25	800	100	C	SFHE9/25
2,5	300	25	600	125	C	SFHE12/25
4,0	300	25	900	125	C	SFHE12/40
4,0	400	25	600	125	C	SFHE16/40
5,0	400	25	700	125	C	SFHE16/50
6,0	450	40	750	150	D	SFHE18/60
8,0	450	40	900	150	D	SFHE18/80



# HEAT EXCHANGERS

## Technical data

Area (m <sup>2</sup> )	Free cross sec.area shell (cm <sup>2</sup> )	Weight empty kg.	Weight with coils full (water) kg.	Shell capacity ltr.	Reference
0,2	4.5	1.0	1.3	1.0	SFHE1.5/2
0,3	5	1.5	2.0	1.25	SFHE2/3
0,35	5	1.8	2.4	2.0	SFHE3/3.5
0,5	18	4.5	5.3	4.0	SFHE4/5
0,6	30	5.0	6.0	6.0	SFHE4/6
1,0	52	6.8	9.5	9.0	SFHE6/10
1,5	52	10.0	14.0	11.0	SFHE6/15
2,5	142	16.0	23.0	18.0	SFHE9/25
2,5	210	21.0	29.0	25.0	SFHE12/25
4,0	258	30.0	43.0	35.0	SFHE12/40
4,0	450	38.0	54.0	55.0	SFHE16/40
5,0	450	41.0	60.0	65.0	SFHE16/50
6,0	820	45.0	61.0	100.0	SFHE18/60
8,0	820	54.0	74.0	107.0	SFHE18/80

## Performance data

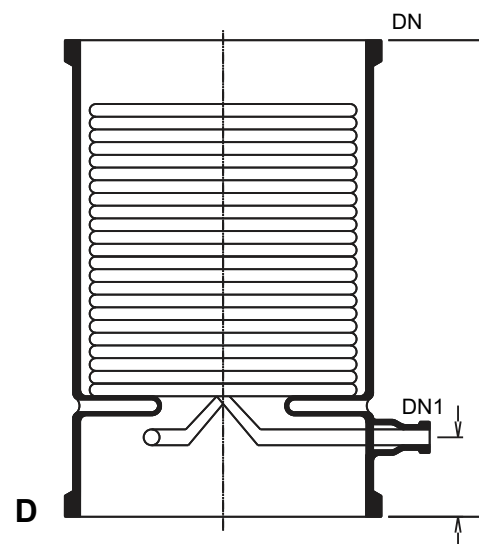
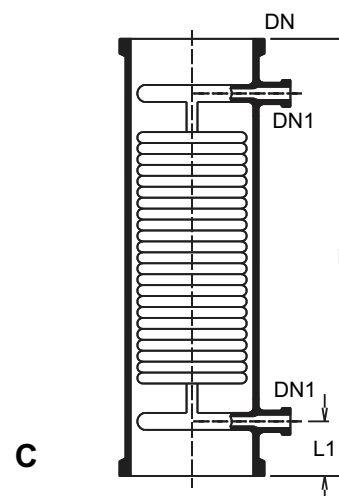
The heat transfer coefficients also varies from one size of condenser to another but as a guide, the table below given as indication of the performance of condenser at atmospheric pressure, using water (inlet temperature 30° C) as coolant in the coils and steam condensing in the jackets.

The figures do not show the maximum performance of the units but are a general indication of typical working conditions.

Jacket Side Medium	Vapour to be Condensed	Liquid	Gas
Coil side medium	Cooling water	Cooling water	Cooling water
Heat transf. coeff			
kcal/hr - m <sup>2</sup> ° C	200-250	100-150	40-60

The table below shows figures calculated on this basis for the condensation of steam at atmospheric pressure and a cooling water throughput for a maximum pressure drop of 2.5 bar in the coils (inlet temperature 30° C).

Area (m <sup>2</sup> )	Coolant Throughput (l/h)	Steam Condensed (kg/h)	Reference
0,2	700	7	SFHE1.5/2
0,3	1200	12	SFHE2/3
0,35	1200	12	SFHE3/3.5
0,5	2200	18	SFHE4/5
0,6	2200	20	SFHE4/6
1,0	2300	32	SFHE6/10
1,5	2300	50	SFHE6/15
2,5	3000	90	SFHE9/25
2,5	2750	80	SFHE12/25
4,0	4200	128	SFHE12/40
4,0	4800	170	SFHE16/40
5,0	5800	185	SFHE16/50
6,0	5800	200	SFHE18/60
8,0	6100	265	SFHE18/80



# HEAT EXCHANGERS

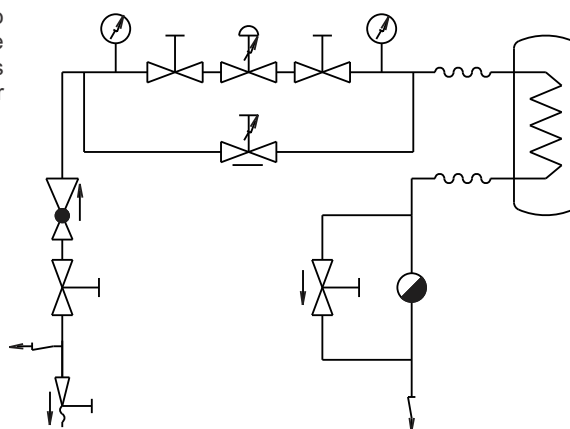
## COIL TYPE BOILERS

Coil type boilers are predominantly used as circulatory evaporators. They are used for vaporizing liquids by passing steam in the coils. Boilers coils are designed to provide bigger cross section in shell side as compared to condensers. The maximum permissible steam pressure at inlet in coil is 3 bars for boilers. This pressure can provide temperature of 143° C with saturated steam. Higher temperature can be achieved by using suitable thermic fluid.

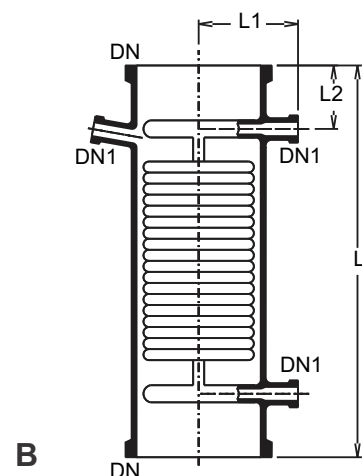
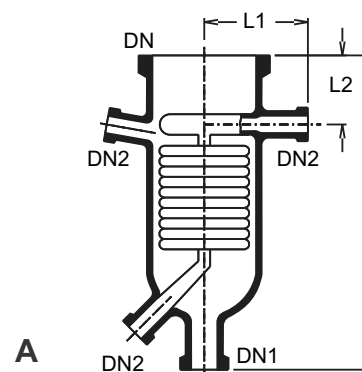
Following points should be taken in account while using coil type boilers.

1. Flexible hoses should be used on coil inlet & outlet.
2. Steam inlet line should be adequately trapped to avoid possibility of steam hammering.
3. Start up by pass valve should be installed on coil outlet to clear the line of very heavy condensate flow produced on start up.
4. Control valve & pressure gauge should be placed very near the steam inlet of the coil.
5. Coil type boilers should not be fitted at bottom of columns or vessels as adequate circulation cannot be guaranteed in these locations.
6. Boiler should be mounted in an external circulatory loop as shown in figure.
7. Boilers can be mounted in series to provide larger heat transfer area.
8. Preheated liquids should be used for better result in boilers.
9. The steam pressure should always be adequate enough to ensure effective & smooth condensate removal. This pressure will vary on the size of boilers.

**Typical Boiler Arrangement**



Area (m <sup>2</sup> )	DN	DN1	DN2	L	L1	L2	Type	Reference
0.15	100	25	25	380	125	100	A	SFHEB 4
0.15	100	25	-	405	125	100	B	SFHEB 4/4
0.50	150	40	25	455	150	90	A	SFHEB 6
0.50	150	25	-	510	150	100	B	SFHEB 6/6
1.50	225	40	25	710	180	140	A	SFHEB 9
1.20	225	25	-	710	180	115	B	SFHEB 9/9
2.00	300	25	25	700	215	135	B	SFHEB 12/12



### Technical data

Area (m <sup>2</sup> )	Capacity Coil (l)	Jacket (l)	Reference
0.15	0.25	2	SFHEB 4
0.15	0.25	3	SFHEB 4/4
0.50	1.3	5	SFHEB 6
0.50	1.3	7	SFHEB 6/6
1.50	4.5	16	SFHEB 9
1.20	4.5	20	SFHEB 9/9
2.00	5.0	40	SFHEB 12/12

# HEAT EXCHANGERS

## Performance data

The maximum permissible steam pressure at the coil inlets of boilers is 3.0 bar.g. which is equivalent to a temperature of about 143°C with saturated steam. Higher temperatures can be achieved by using heat transfer fluids.

The heat transferred in most size can be considered on average as 400 W/m<sup>2</sup>K a steam pressure in the coils of 3.0 bar.g, although this figure declines marginally at lower pressure.

The table shows typical performances of boilers indicating the amount of water evaporated at atmospheric pressure with steam in the coils at various pressure.

Note : if the feed is cold, the performance of the boiler will be only about 85% of the figures quoted.

Surface are (m <sup>2</sup> )	Steam pressure (bar.g)	Water evaporated (kg/h)	Reference
0.15	1.0	1.9	SFHEB 4
	3.0	4.1	
0.50	1.0	6.5	SFHEB 6
	3.0	12	
1.50	1.0	19	SFHEB 9
	3.0	41	
0.15	1.1	1.9	SFHEB 4/4
	3.0	41	
0.50	1.0	6.5	SFHEB 6/6
	3.0	13	
1.20	1.0	14	SFHEB 9/9
	3.0	41	
2.0	3.0	51	SFHEB 12/12

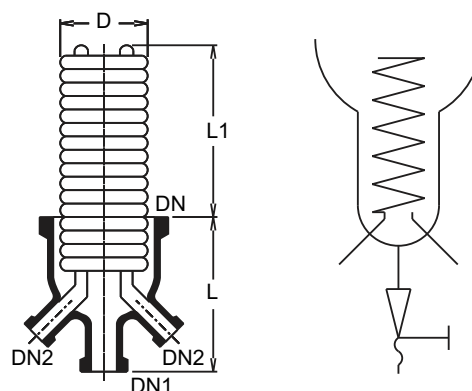
## IMMERSION HEAT EXCHANGERS

Immersion heat exchangers are used to control exothermic reactions in the glass vessels They can be used in vessels with wider bottom outlet

Following points should be taken in account while using coil type boiler

1. Immersion heat exchangers are not recommended for use with products, which have a tendency to crystallise.
2. The coils must always be completely immersed in liquid.

Actual H.T.A.m <sup>2</sup>	DN	DN1	DN2	L	L1	D	Reference
0.4	150	40	25	200	200	145	SFHEM 6
0.6	225	40	25	300	200	200	SFHEM 9

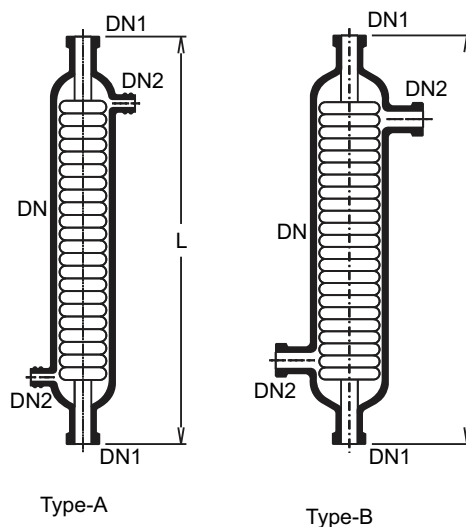


## HEAT EXCHANGERS

### LIQUID COOLERS

Liquid coolers are used typically for the cooling of products from distillation columns and can be connected directly to the reflux head in a column. The product flows from top to the bottom of the unit through the coil battery across which the cooling water flows from bottom to top in the shell. Liquid coolers provide more resident time to the product to be cooled.

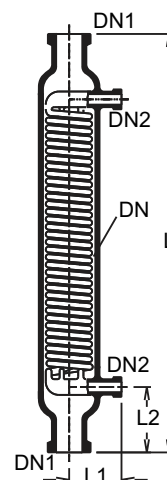
Area (m <sup>2</sup> )	DN	DN1	DN2	L	Type	Reference
0.1	40	25	16	600	A	SFHEF 1/1
0.2	50	25	16	600	A	SFHEF 1/2
0.3	80	25	16	600	A	SFHEF 1/3
0.35	100	25	19	600	A	SFHEF 1/3.5
0.50	150	25	25	600	B	SFHEF 1/5
1.00	150	25	25	600	B	SFHEF 1/10
1.25	150	25	25	850	B	SFHEF 1/15



### VENT CONDENSERS

Vent condenser is installed before vacuum pumps or in vent gas lines to remove any components in vapour form still remaining in the gas stream after the main condenser. Their compact design makes them ideal for fitting directly in pipe work without the need for any reduction.

Area (m <sup>2</sup> )	DN	DN1	DN2	L	L1	L2	Reference
0.6	100	25	15	800	100	125	SFHEG 1/6
0.6	100	50	15	800	100	125	SFHEG 2/6



# HEAT EXCHANGERS

## SHELL AND TUBE HEAT EXCHANGERS

Shell & tube exchangers are used particularly where large heat transfer area is required in combination with efficient heat transfer & compactness. These are widely used in industry for duties like cooling, heating, condensation, evaporation etc. They can be designed for single pass or multi-pass on tube side as per your requirement. The overall heat transfer coefficient in shell and tube heat exchanger is about three times higher than in coil type heat exchangers. Whenever requirement of heat transfer area is high; shell & tube heat exchanger is the only alternative. The pressure drop of coolant in shell & tube heat exchanger is minimal compared to approximately 2 kgs in coil type heat exchanger.

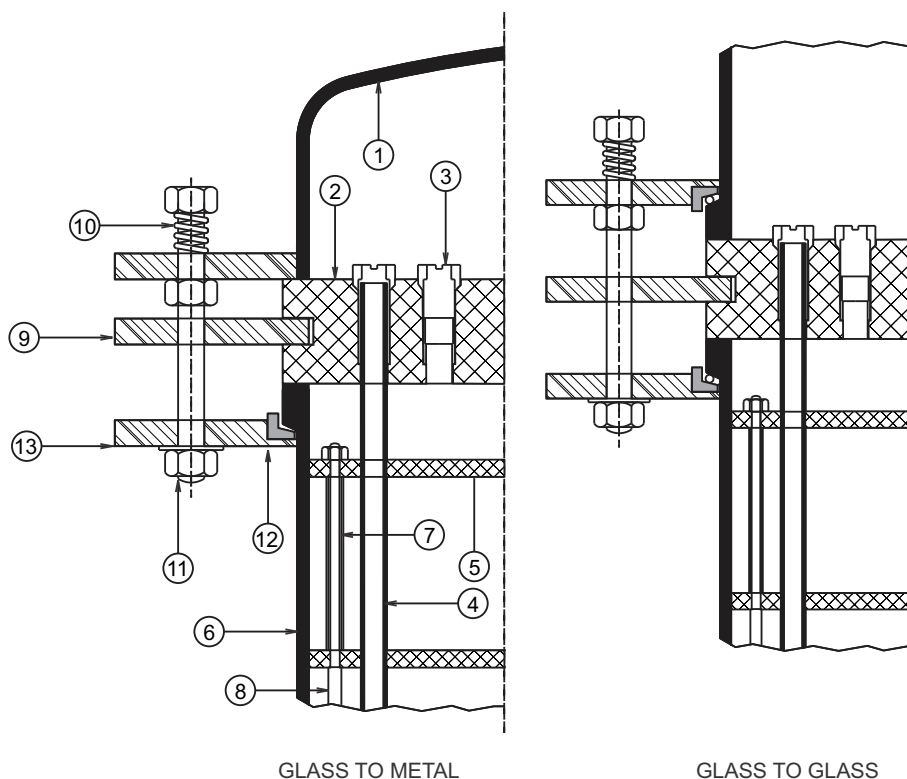
### Range of the models

Shells	End Fittings	Tubes	Number of passes	Reference
Glass	Glass	Glass	1	SFRGG
Glass	Steel	Glass	1/2/3	SFRGM
Steel	Glass	Glass	1	SFRMG

### Construction Features

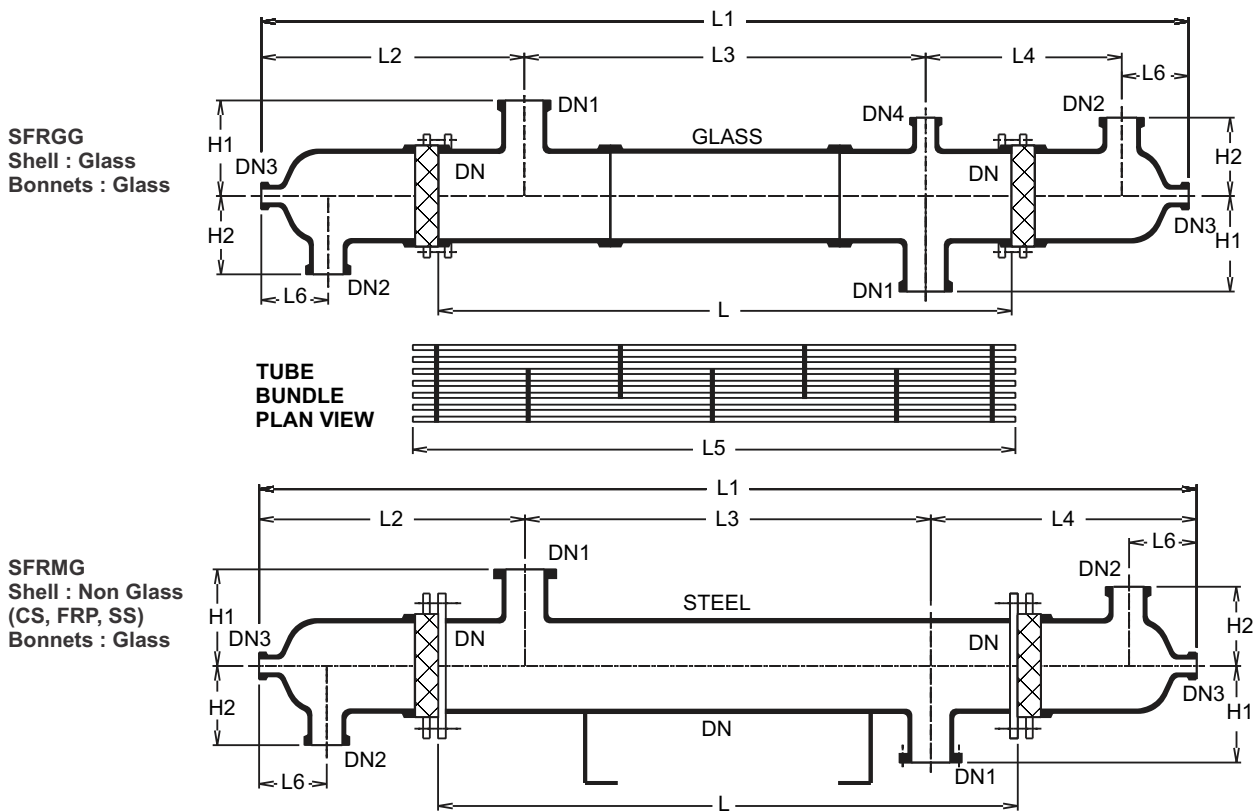
The glass tube are sealed individually into PTFE tube sheet with special PTFE sockets and packing. This unique ferrule type sealing arrangement permits easy replacements and cleaning of tubes. Baffles on shell side ensure improved heat transfer by increased turbulence. Further details of construction can be seen in the diagram.

- 1 METAL / GLASS BONNET
- 2 PTFE TUBE SHEET
- 3 THREADED BUSH
- 4 GLASS TUBE
- 5 BAFFLE
- 6 METAL / GLASS SHELL
- 7 PTFE TUBE
- 8 TIE ROD IN PTFE
- 9 CAST IRON FLANGE
- 10 SPRING
- 11 SCREWED ROD OR NUT
- 12 INSERT
- 13 FLAT WASHER



# HEAT EXCHANGERS

## SHELL & TUBES



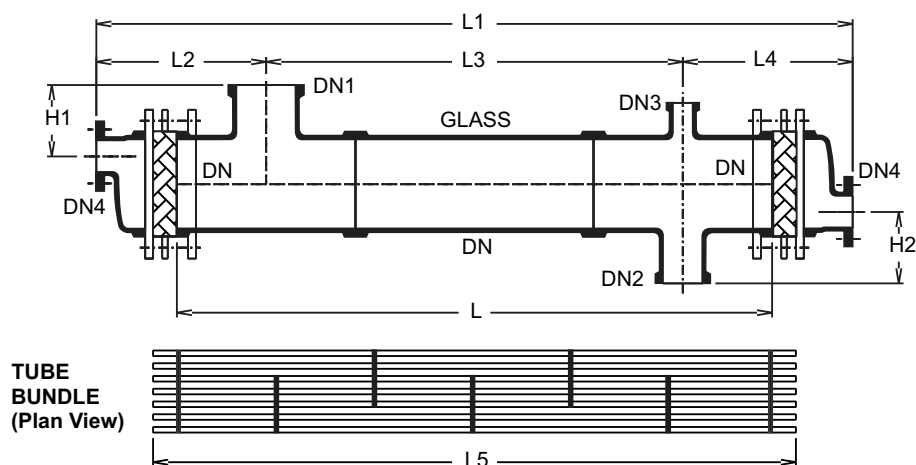
Reference	4/2		4/3	6/1		6/2	6/3	6/4	6/5	6/6	9/4		9/5	9/6	9/8	9/10	9/12	12/10	12/12	12/16	12/21	12/25
SFRGG																						
SFRMG																						
HTA (sq.m.)	2	3		1	2	3	4	5	6		4	5	6	8	10	12		10	12	16	21	25
DN	100					150							225							300		
DN1	50					80							100							150		
DN2	40					50							80							80		
DN3	25					25							40							40		
DN4	40					50							50							50		
H1	125					175							250							300		
H2	125					150							205							240		
L	2600	3870		1300	1480	1950	2450	3250	3950		1300	1600	1930	2430	3230	3930		1500	1900	2400	3200	3900
L1	3105	4380		1890	2075	2545	3045	3850	4550		2240	2545	2885	3375	4180	4880		2520	2925	3425	4230	4465
L2	375					445							695							735		
L3	2355	3630		1000	1180	1655	2155	2960	3660		850	1155	1485	1985	2790	3490		1050	1455	1955	2760	3465
L4	375					445							695							735		
L5	2660	3935		1375	1555	2030	2530	3335	4035		1395	1700	2030	2530	3335	4035		1625	2030	2530	3335	4035
L6	85					115							175							200		
NT	19			19	37	37	37	37	37				73							151		
NB	19	24		07	08	11	14	19	24		4	5	7	9	13	17		4	5	7	10	15
TS	40					50							60							75		
Weight in Kg. (Approx.)																						
SFRGG	37	49		38	44	54	60	74	82	76	90	98	110	138	155	152	179	200	245	276		
SFRGM	43	55		48	54	64	70	84	92	80	94	102	114	142	158	156	203	204	249	280		
TS = Tube Sheet				NB = No. of Baffles				L = Shell Length														
DN = Shell Dia				NT = No. of Tubes				L5 = Tube Length														

All Glass Tubes have an external diameter of 14mm and a wall thickness of 1.5mm (min.)  
Orientation of branch connections can be changed on request.

# HEAT EXCHANGERS

## SHELL & TUBES

SF RGM  
 Shell : Glass  
 Bonnets : Non Glass  
 (CS, FRP, SS)



Reference SFRGM	4/2	4/3	6/1	6/2	6/3	6/4	6/5	6/6	9/4	9/5	9/6	9/8	9/10	9/12	12/10	12/12	12/16	12/21	12/25
HTA (sq.m.)	2	3	1	2	3	4	5	6	4	5	6	8	10	12	10	12	16	21	25
DN	100				150							225					300		
DN1	80				100							150					225		
DN2	50				80							100					150		
DN3	40				50							80					80		
DN4	40				50							80					80		
H1	150				200							275					300		
H2	125				175							250					300		
L	2600	3870	1300	1480	1950	2450	3250	3950	1300	1600	1930	2430	3230	3930	1500	1900	2400	3200	3900
L1	2915	4190	1650	1835	2305	2805	3610	4310	1730	2035	2365	2865	3670	4370	2060	2465	2965	3770	4470
L2	305				325							440					580		
L3	2330	3605	1025	1210	1680	2180	2985	3685	850	1155	1485	1985	2790	3490	975	1380	1880	2685	3385
L4	280				325							440					505		
L5	2660	3935	1375	1555	2030	2530	3335	4035	1395	1700	2030	2530	3335	4035	1625	2030	2530	3335	4035
NT	19		19	37	37	37	37	37				73					151		
NB	19	24	07	08	11	14	19	24	4	5	7	9	13	17	4	5	7	10	15
TS	40				50							60					75		
TS = Tube Sheet			NB = No. of Baffles			L = Shell Length													
DN = Shell Dia			NT = No. of Tubes			L5 = Tube Length													

All Glass Tubes have an external diameter of 14 mm and a wall thickness of 1.5mm (min.)  
 Orientation of branch connections can be changed on request.

# HEAT EXCHANGERS

## Permissible Operating Conditions

For both coil type and shell and tube heat exchangers the permissible operating conditions for glass shell and headers are based on the diameter.

All Heat Exchangers can be operated under full vacuum.

Operating Temperature Range : (–) 40°C to 200°C on either side.

Diff. temperature : <120°C]

For shell and tube type heat exchangers, the permissible operating conditions for steel shell and bonnet can be determined from the table.

		DN 100	DN 150	DN 225	DN 300
Detail of Construction		Max.	Max.	Max.	Max.
Shell Side	Glass	2.0	2.0	1.0	0.7
	Shell	bar.g	bar.g	bar.g	bar.g
	Steel	3.5	3.5	3.5	3.5
	Shell	bar.g	bar.g	bar.g	bar.g
Tube Side	Glass	2.0	2.0	1.0	0.7
	Bonnet	bar.g	bar.g	bar.g	bar.g
	Steel	2.5	2.5	2.5	2.5
	Bonnet	bar.g	bar.g	bar.g	bar.g

## Performance & design data

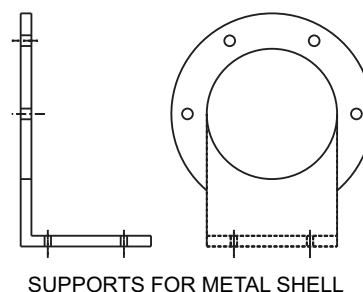
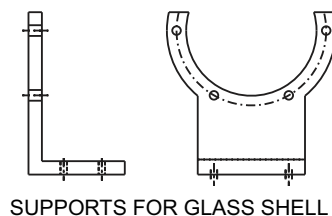
Table given below indicates performance of glass shell and tube heat exchanger in several typical application. More specific advice can be given on receipt of details.

Type of Heat transfer	Basic	Kcal/m <sup>2</sup> hr°C
Liquid - Liquid Cooling -	Water - water	500 - 600
	Water - organic solvents	250 - 600
	Water - oil	75 - 350
	Water - air	25 - 250
Liquid - Gas Condensation -	Water - water	600 - 900
	Water - organic solvents	400 - 600
Evaporation -	Steam - organic solvents	400 - 600
	Steam - water	500 - 900

## Support

Generally two types of supports are used in shell and tube heat exchanger depends upon MOC of shell & tube heat exchangers.

MOC of these supports is MS.



# COLUMN COMPONENTS



## INTRODUCTION

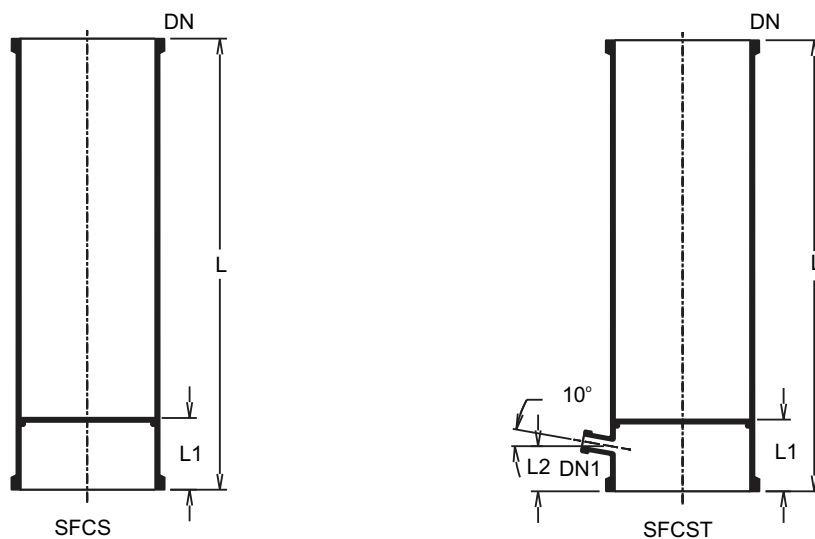
SIGMA column components provide the optimum solution for every requirement such as distillation, absorption, reaction, rectification & extraction because of wide range of different components available. This applies not only to various types of column & pipe sections available but also to the wide selection of internals & packing that can be supplied. The transparency factor of glass column is a particular advantage in visual monitoring of the process at all times.

The complete range of standard column components is described on the following pages, of the support. Non-standard components can also be supplied as per your order.

# COLUMN COMPONENTS

## COLUMN SECTIONS

Depending on the nominal size, column sections are supplied in 1000 and/or 1500 mm lengths. The column sections are provided with fused shelf where packing support can rest. Column section can also be provided with a thermometer branch below the packing support. Column section & pipe section may be used for construction of the columns of all nominal bores provided the weight of the packing & retained liquid does not exceed the load bearing capacity of the support



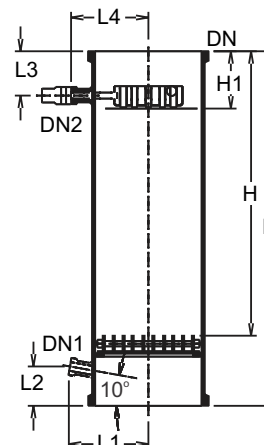
DN	DN1	L	L1	L2	Reference without thermometer branch	Reference with thermometer branch
80	25	1000	125	100	SFCS 3/1000	SFCST 3/1000
100	25	1000	125	100	SFCS 4/1000	SFCST 4/1000
150	25	1000	125	100	SFCS 6/1000	SFCST 6/1000
225	25	1000	125	100	SFCS 9/1000	SFCST 9/1000
225	25	1500	150	125	SFCS 9/1500	SFCST 9/1500
300	25	1000	150	125	SFCS 12/1000	SFCST 12/1000
300	25	1500	150	125	SFCS 12/1500	SFCST 12/1500
400	25	1000	200	150	SFCS 16/1000	SFCST 16/1000
400	25	1500	200	150	SFCS 16/1500	SFCST 16/1500
450	25	1000	200	150	SFCS 18/1000	SFCST 18/1000
450	25	1500	200	150	SFCS 18/1500	SFCST 18/1500
600	25	1500	200	150	SFCS 24/1500	SFCST 24/1500

	Free cross-section			Packing		Packing on support		
	Column Section	Support CP/HD2	Support plate CP	Volume	Minimum packing size	Stacked	Random packed	Size
DN1	(%)	(%)	(%)	(l/m)	(mm)	(l)	(l)	(l)
80	65	45	70	5	8	-	-	-
100	60	45	70	9	10	-	-	-
150	50	50	70	19	15	-	-	-
225	65	50	80	40	20	-	-	-
300	70	60	80	75	25	-	-	-
450	70	70	-	165	25	8	16	FC 50
600	75	70	-	295	40	28	-	FC 50

# COLUMN COMPONENTS

## COLUMN SECTION FOR LIQUID DISTRIBUTION

Irrespective of the nominal size, these column sections are supplied in one length only so that they still provide sufficient height for packing. They have three extra side branches offset at 120° from each other so that a nozzle type distributor can be fitted to redistribute the liquid. This column section can be supplied with or without thermometer branch.

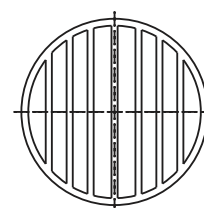
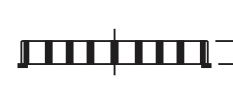


DN	DN1	DN2	L	H	H1	L1	L2	L3	L4	Reference without thermometer branch	Reference with thermometer branch
225	25	25	1500	1330	150	171	111	110	165	SFCSV 9/1500	SFCSVT 9/1500
300	25	25	1500	1325	165	221	111	125	218	SFCSV 12/1500	SFCSVT 12/1500
450	25	40	1500	1234	205	299	151	135	300	SFCSV 18/1500	SFCSVT 18/1500
600	25	40	1500	1209	255	377	151	175	380	SFCSV 24/1500	SFCSVT 24/1500

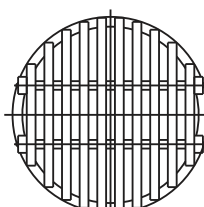
## PACKING SUPPORTS

For nominal size up to DN 300 we supply "CP" borosilicate glass 3.3 packing support for the column sections. For larger diameters we provided "HD" packing support for which a combination of glass & PTFE is used. Both types are seated on PTFE ring which is supplied complete with the support. Details concerning free cross sections of the support and their load bearing capacities when loaded evenly and on minimum size of the packing to be used are given on the previous page.

DN	L	Maximum load (kg)	Type	Reference
80	10	10	A	SFCP 3
100	12	15	A	SFCP 4
150	12	30	A	SFCP 6
225	12	50	A	SFCP 9
300	12	75	A	SFCP 12
400	70	150	B	SFHD 16
450	70	200	B	SFHD 18
600	95	300	B	SFHD 24



Type-A



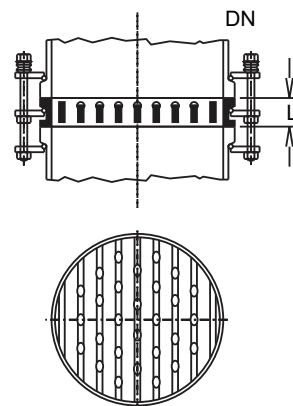
Type-B

# COLUMN COMPONENTS

## SUPPORT PLATES FOR PIPE SECTIONS

These items are used with pipe sections. This alternative provides larger free cross section & more packing height than the combination of column section with packing support. This assembly consists of a glass support plate, a metal flange, a PTFE O ring and nut bolts. Details concerning free cross section of the support & their load bearing capacities when loaded evenly can be found in the table below.

DN	L	Maximum load (kg)	Reference
80	25	20	SFCPE 3
100	25	30	SFCPE 4
150	50	60	SFCPE 6
225	50	90	SFCPE 9
300	50	150	SFCPE 12

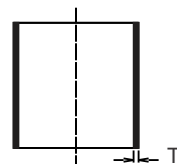


## COLUMN PACKING

Due to their low bulk densities, glass raschig rings are particularly suitable for packing glass columns. The ratio of column diameter to packing diameter should not be less than 8:1.

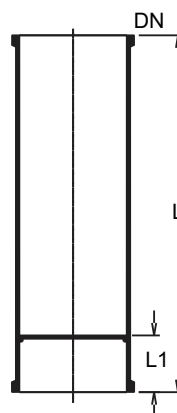
The technical detail of the raching rings are listed in the table below.

Size	Bulk density (kg/l)	Specific surface (m <sup>2</sup> /m <sup>3</sup> )	Wall thickness (t)	Reference
8 x 8	0.68	500	1.0	SFFC 8
10 x 10	0.58	450	1.0	SFFC 12
15 x 15	0.44	300	1.6	SFFC 15
20 x 20	0.28	280	1.1	SFFC 20
25 x 25	0.27	200	2.0	SFFC 25
30 x 30	0.40	176	2.0	SFFC 30
40 x 40	0.29	160	1.75	SFFC 40
50 x 50	0.32	120	2.0	SFFC 50



## Packing requirement for various column section(kgs.)

Column section size	Packing size (mm)								
	Vol liter	SFFC 8	SFFC 12	SFFC 15	SFFC 20	SFFC 25	SFFC 30	SFFC 40	SFFC 50
SFCS 3/1000	4.4	2.6	2.2	3.3	2.0	1.2	1.8	1.2	1.1
SFCS 4/1000	7.6	4.6	3.8	5.7	3.4	2.1	3.0	2.1	1.9
SFCS 6/1000	15.5	9.3	7.8	11.6	7.0	4.2	6.2	4.2	3.9
SFCS 9/1000	31.8	19.1	15.9	23.9	14.3	8.6	12.7	8.6	8.0
SFCS 12/1000	61.9	37.1	31.0	46.4	27.9	16.7	24.8	16.7	15.5
SFCS 16/1000	110	66.0	55.0	82.5	49.5	29.7	44.0	29.7	27.5
SFCS 18/1000	145	87.0	72.5	108.8	65.3	39.2	58.0	39.2	36.3
SFCS 24/1000	255	153.0	127.5	191.3	114.8	68.9	102.0	68.9	63.8



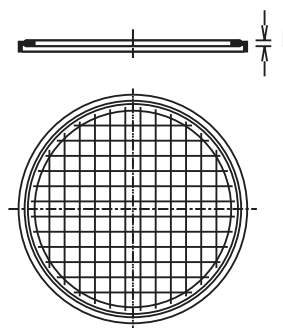
### Notes of use of column packing

- \* Generally, the ratio of Column diameter to packing diameter should not be less than 8:1.
- \* When using smaller packing size, a small layer of larger packing should be used on Packing support, to prevent the smaller packing falling through.
- \* Due to their low bulk densities, Glass Raschig rings are particularly suitable for packing glass columns.
- \* In vacuum application and applications involving high vapour velocities, packing may be, lifted and may damage to other parts. To prevent this, a packing retainer ( PTFE perforated plates ) should be used.

# COLUMN COMPONENTS

## PACKING RETAINERS/PTFE PERFORATED PLATES

Packing retainers are installed above packed column section to prevent any carry over of column packing resulting in damage to reflux separators or condenser. They are installed in the same way as gasket between two flat buttress end and thus no additional gasket is required.



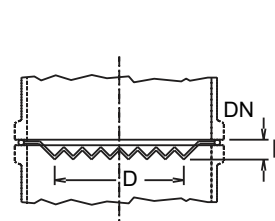
DN1	L	Free cross-section (%)	Reference
80	7	80	SFCPP 3
100	9	90	SFCPP 4
150	10	90	SFCPP 6
225	12	95	SFCPP 9
300	16	85	SFCPP 12

## PTFE Redistributors

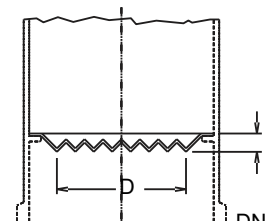
Redistributors are made of selected PTFE. They are clamped in the coupling of a pipe or a column section in the same way as a gasket so the no additional gasket is required.

The act as simple liquid collectors and direct the liquid away form the walls. Their inside diameter is designed to match nozzle type distributors.

DN	D	L	Reference
40	28	10	SFTL 1.5
50	35	10	SFTL 2
80	55	10	SFTL 3
100	70	15	SFTL 4
150	105	15	SFTL 6
225	140	15	SFTL 9
300	200	15	SFTL 12



Type - A

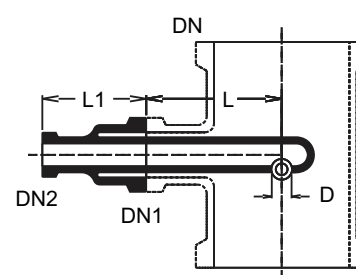


Type - B

## COLUMN FEED PIPE

Column feed pipes can be used in diameters & type of columns where it is acceptable for the liquid feed to be directed in a single stream on to the column packing.

DN	DN1	DN2	D	L	L1	Reference
80	40	25	13	100	115	SFFP 3
100	40	25	13	125	115	SFFP 4
150	40	25	13	150	115	SFFP 6
225	40	25	13	185	115	SFFP 9
300	40	25	13	230	115	SFFP 12
450	80	40	25	320	150	SFFP 18
600	150	50	40	450	200	SFFP 24



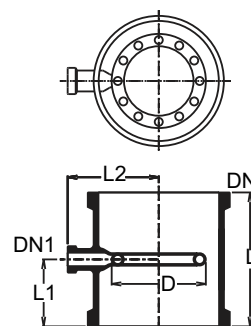
Type-A

# COLUMN COMPONENTS

## SPRAY FEED SECTIONS

Spray feed section with built in feed pipe is used when finer distribution of liquid stream is desired. This component delivers liquid to the column in the form of a ring.

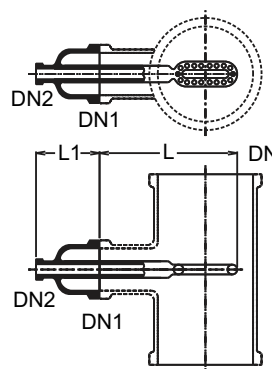
DN	DN1	L	L1	L2	DIA OF HOLE x NO.OF HOLES	Reference
80	25	200	100	100	2 x 20	SFFR 3
100	25	250	125	110	2 x 20	SFFR 4
150	25	250	125	150	2 x 27	SFFR 6
225	25	250	125	170	2 x 27	SFFR 9
300	25	300	150	220	2 x 30	SFFR 12



## SPRAY FEED PIPES

Spray feed pipes can be inserted through unequal tee in to the column to provide finer distribution of liquid.

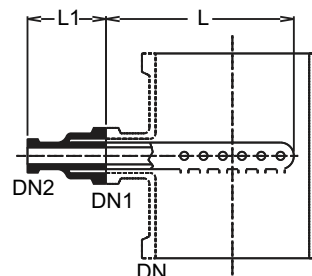
DN	DN1	DN 2	L	L1	DIA OF HOLE x NO.OF HOLES	Reference
150	80	25	225	125	27 x 2mm	SFFD 6
225	100	25	325	150	27 x 2mm	SFFD 9
300	150	25	400	200	30 x 3mm	SFFD 12
400	150	50	500	200	39 x 3mm	SFFD 16
450	150	50	550	200	39 x 3mm	SFFD 18
600	150	50	700	200	60 x 3mm	SFFD 24



## COLUMN FEED SPARGER

Column feed sparger can be fitted through unequal tee & has holes on three sides to sparge the material.

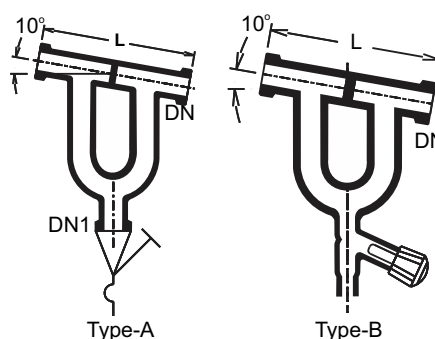
DN	DN1	DN 2	L	L1	DIA OF HOLE x NO.OF HOLES	Reference
80	25	25	125	100	21 x 2mm	SFSPG 3
100	25	25	150	100	21 x 2mm	SFSPG 4
150	40	25	200	100	27 x 2mm	SFSPG 6
225	40	25	275	100	27 x 2mm	SFSPG 9
300	40	25	350	100	30 x 3mm	SFSPG 12
400	40	25	450	100	39 x 3mm	SFSPG 16
450	40	25	500	100	39 x 3mm	SFSPG 18
600	50	40	650	100	60 x 3mm	SFSPG 24



## LIQUID SEALS

Liquid seals are fitted on the off-take branch of the reflux separators to prevent vapours from passing directly to the after-coolers & receivers.

DN	DN1	L	Type	Reference
25	25	200	A	SFLS 1
40	25	300	A	SFLS 1.5
25	-	200	B	SFLSV 1



# COLUMN COMPONENTS

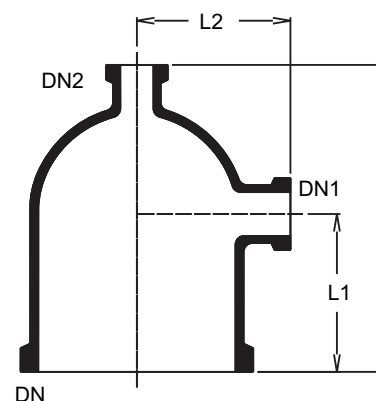
## COLUMN ADAPTORS

Column adaptors are used as the top component in rectification & absorption columns. They are available in three different versions.

## ROUND TOP COLUMN ADAPTORS

All round top column adaptors have an additional branch that can be used to insert a measuring probe

DN	DN1	DN2	L	L1	L2	Reference
80	25	25	150	75	100	SFCA 3/1/1
80	40	25	200	100	100	SFCA 3/1.5/1
80	50	25	200	100	100	SFCA 3/2/1
100	25	25	175	75	125	SFCA 4/1/1
100	40	25	200	100	125	SFCA 4/1.5/1
100	50	25	250	125	125	SFCA 4/2/1
100	80	25	250	125	125	SFCA 4/3/1
150	25	25	200	100	150	SFCA 6/1/1
150	40	25	200	100	150	SFCA 6/1.5/1
150	50	25	250	125	150	SFCA 6/2/1
150	80	25	300	150	150	SFCA 6/3/1
150	100	25	300	150	175	SFCA 6/4/1
225	40	40	250	125	175	SFCA 9/1.5/1.5
225	50	40	300	150	175	SFCA 9/2/1.5
225	80	40	300	150	200	SFCA 9/3/1.5
225	100	40	300	150	200	SFCA 9/4/1.5
225	150	40	400	175	250	SFCA 9/6/1.5
300	40	40	300	150	225	SFCA 12/1.5/1.5
300	50	40	300	150	225	SFCA 12/2/1.5
300	80	40	350	150	250	SFCA 12/3/1.5
300	100	40	400	175	250	SFCA 12/4/1.5
300	150	40	450	225	250	SFCA 12/6/1.5
300	225	40	500	225	300	SFCA 12/9/1.5
400	50	50	400	200	300	SFCA 16/2/2
400	80	50	450	250	300	SFCA 16/3/2
400	100	50	450	250	300	SFCA 16/4/2
400	150	50	600	300	350	SFCA 16/6/2
400	225	50	600	300	350	SFCA 16/9/2
450	50	50	400	200	325	SFCA 18/2/2
450	80	50	450	250	350	SFCA 18/3/2
450	100	50	450	250	350	SFCA 18/4/2
450	150	50	600	300	350	SFCA 18/6/2
450	225	50	750	300	400	SFCA 18/9/2
450	300	50	800	400	400	SFCA 18/12/2
600	50	50	450	200	400	SFCA 24/2/2
600	80	50	500	250	400	SFCA 24/3/2
600	100	50	500	250	400	SFCA 24/4/2
600	150	50	650	300	450	SFCA 24/6/2
600	225	50	650	300	450	SFCA 24/9/2
600	300	50	800	400	500	SFCA 24/12/2

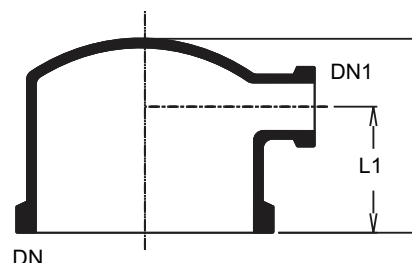


# COLUMN COMPONENTS

## FLAT TOP COLUMN ADAPTORS

Flat top column adaptors have a small side branch as a standard. This type is usually selected where there is restricted headroom.

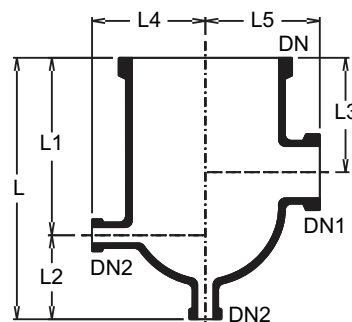
DN	DN1	L	L1	Reference
80	25	100	75	SFFCA 3/1
80	40	125	100	SFFCA 3/1.5
100	25	100	75	SFFCA 4/1
100	40	125	100	SFFCA 4/1.5
150	25	150	100	SFFCA 6/1
150	40	150	100	SFFCA 6/1.5
150	50	200	125	SFFCA 6/2
150	80	200	150	SFFCA 6/3
225	40	200	150	SFFCA 9/1.5
225	50	200	150	SFFCA 9/2
225	80	250	175	SFFCA 9/3
225	100	250	175	SFFCA 9/4
300	50	250	150	SFFCA 12/2
300	80	250	150	SFFCA 12/3
300	100	300	175	SFFCA 12/4
300	150	350	225	SFFCA 12/6



## MULTI NECK COLUMN ADAPTORS

Multi neck column adaptors are with additional neck which can be used for measuring probe and vent with simultaneous feed nozzle or drain function.

DN	DN1	DN2	L	L1	L2	L3	L4	L5	Reference
100	50	25	400	250	150	150	125	125	SFCAM 4/2/1/1
150	80	25	400	250	150	150	150	150	SFCAM 6/3/1/1
225	80	25	400	275	125	175	175	200	SFCAM 9/3/1/1
300	80	25	400	250	150	150	225	250	SFCAM 12/3/1/1
300	100	40	400	225	250	150	225	250	SFCAM 12/4/1.5/1
300	150	40	450	225	250	200	300	250	SFCAM 12/6/1.5/1
300	225	40	600	350	225	250	225	325	SFCAM 12/9/1.5/1



## REFLUX SEPARATORS

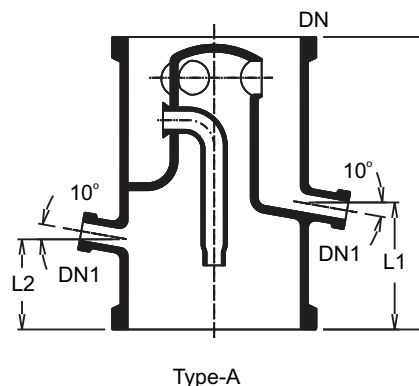
Reflux separators are used to control the reflux ratio in rectification columns to separate the condensate produced in to reflux & take off streams. They can be of manual or magnetic types.

## MANUALLY OPERATED REFLUX SEPARATORS

In these units, the reflux adjusted by means of a manually operated valve on the distillate outlet connection. When the valve is fully open, the divider is set to total distillate off-take as the return pipe is located higher than the outlet connection. By regulating the valve, the reflux ratio can be continuously adjusted up to total reflux.

A specific reflux ratio cannot be set.

DN	DN1	L	L1	L2	Type	Reference
80	25	200	115	82	A	SFRDA 3
100	25	250	145	95	A	SFRDA 4
150	25	250	145	100	A	SFRDA 6
225	25	375	165	115	A	SFRDA 9
300	25	375	165	110	A	SFRDA 12
400	40	500	200	150	B	SFRDA 16
450	40	600	275	150	B	SFRDA 18

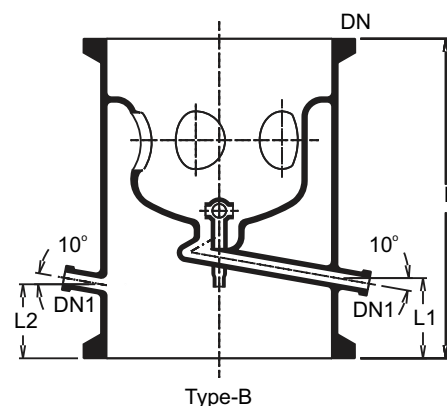


Type-A

# COLUMN COMPONENTS

## Flow Data

Minimum free Cross-section for vapours (cm <sup>2</sup> )	Maximum distillate Volume in relation to water at 20° (l/h)	Reference
10	300	SFRDA 3
20	475	SFRDA 4
40	700	SFRDA 6
150	900	SFRDA 9
170	1100	SFRDA 12
220	1350	SFRDA 16
670	1500	SFRDA 18



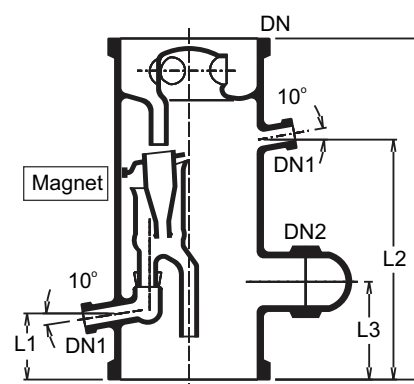
## ELECTRO-MAGNETICALLY OPERATED REFLUX SEPARATORS

This type of reflux separator uses a swinging funnel mechanism. The funnel which has a soft iron core sealed in to it, is operated magnetically from outside the column by means of a timer. When the electro magnet is not energized the funnel is at rest & all the condensate is returned to the column. Activation of the electromagnet moves the funnel in to the off-take position and the distillate is removed from the column via the off-take branch.

DN	DN1	DN2	L	L1	L2	L3	References
80	25	-	375	75	75	-	SFRHM 3
100	25	-	450	90	90	-	SFRHM 4
150	25	80	450	90	90	100	SFRHM 6
225	25	100	550	115	100	150	SFRHM 9
300	25	100	700	125	430	150	SFRHM 12
450	40	150	900	165	305	200	SFRHM 18

## Flow Data

Minimum free cross-section for vapours (cm <sup>2</sup> )	Maximum distillate volume in relation to water at 20° C (l/h)
10	90
20	180
40	300
150	525
170	675
500	1350

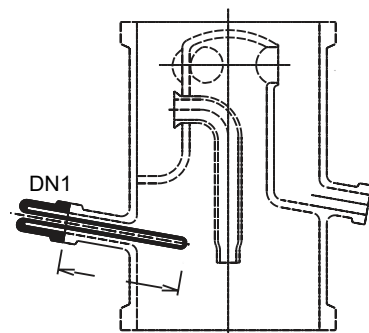


## COLUMN COMPONENTS

### TEMPERATURE POCKET FOR REFLUX SEPARATORS

These thermometer pockets are used with Reflux Divider or Column Components.

DN	DN1	L	Reference
80	25	80	SFTPG 3
100	25	100	SFTPG 4
150	25	125	SFTPG 6
225	25	150	SFTPG 9
300	25	200	SFTPG 12
450	40	400	SFTPG 18



# MEASUREMENT AND CONTROL



## INTRODUCTION

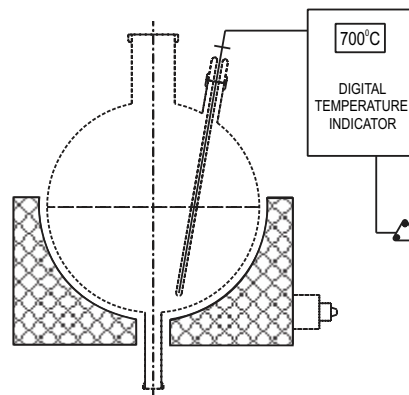
SIGMA measurement and control equipment complement the component range and helps to ensure that borosilicate glass 3.3 plant and apparatus operates correctly & safely. The full range of standard components is described on the following pages, Non-standard components can also be supplied as per your order.

## MEASUREMENT AND CONTROL

### DIGITAL TEMPERATURE INDICATOR

This instrument is used to monitor temperature of liquid or gases in glass assemblies. The system consists of resistance temperature detector (RTD) and temperature display unit. The standard unit display temperature in degree celsius and works on 220 V, 50 Hz power supply.

Vessel Cap.(Ltr.)	RTD Length	Reference
20	400	SFDTI 20
50	500	SFDTI 50
100	600	SFDTI 100
200	700	SFDTI 200

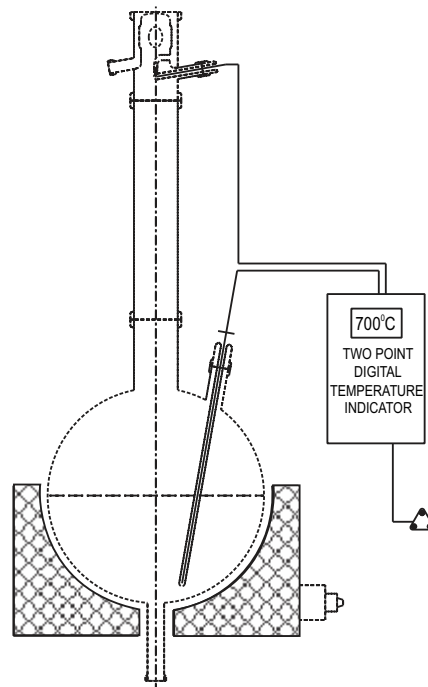


### TWO POINT DIGITAL TEMPERATURE INDICATOR

This instrument is used to monitor simultaneously temperature of liquid & gases in glass assemblies at two points. It is mainly used to monitor temperature of liquid & vapours in a glass distillation unit.

The system consists of two resistance temperature detector (RTD) and Temperature display unit. The standard unit display temperature in degree celsius with switch to monitor two temperature and works on 220V, 50 Hz power supply.

Vessel Cap.(Ltr.)	RTD Length for Vessel	RTD Length for Reflux Divider	Reference
20	400	220	SFDTT 20
50	500	225	SFDTT 50
100	600	250	SFDTT 100
200	700	300	SFDTT 200

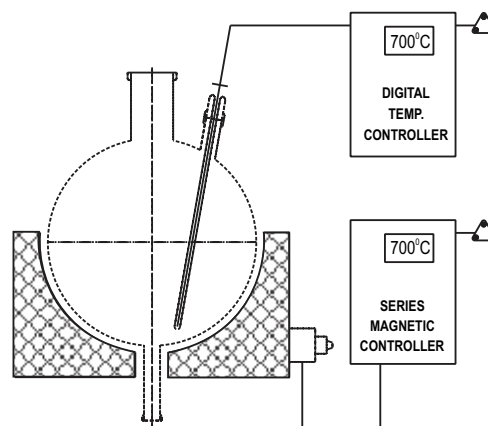


# MEASUREMENT AND CONTROL

## CONTINUOUS TEMPERATURE CONTROLLER

This instrument is primarily used to maintain temperature in glass assembly while it is heated by electric heating unit. The system works by switching power of electric heating On & Off based on the desired temperature of glass assembly set in the unit. The system works on the maximum and minimum temperature band set in the controller. RTD sensor in the glass assembly monitors the temperature. As long as the temperature in the glass assembly is lower than the set maximum temperature the power is on to the electric heating unit. When the temperature in glass assembly reaches maximum temperature; the power is switched off to the heating unit. The power is switched on to the heating unit once again when the glass assembly temperature reaches the minimum temperature set in the controller unit. The standard unit display temperature in degree celsius and works on 220 V, 50 Hz power supply.

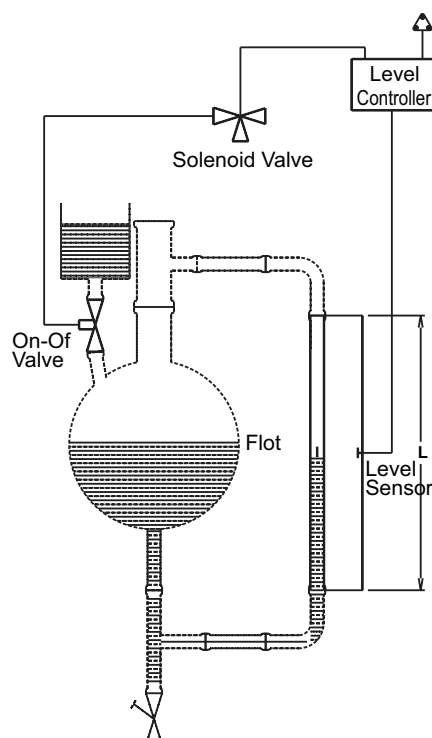
Vessel Cap.(Ltr.)	RTD Length	Reference
20	400	SFCTC 20
50	500	SFCTC 50
100	600	SFCTC 100
200	700	SFCTC 200



## AUTOMATIC LEVEL CONTROLLER

This system is used for automatic control of liquid level in the glass vessel. The system comprises of bypass tube in which a glass float with a built in magnet moves up & down. The level sensors are mounted next to the tube at desired levels. The system opens the inlet flow valve when the float level falls to the minimum level & closes the inlet valve when the float level rises to the maximum level. A reverse phenomenon is used with control of outlet valve when excess fluid in vessel is desired to be removed from the vessel.

Vessel Cap.(ltr.)	L	Reference
20	375	SFALC 20
50	500	SFALC 50
100	600	SFALC 100
200	750	SFALC 200

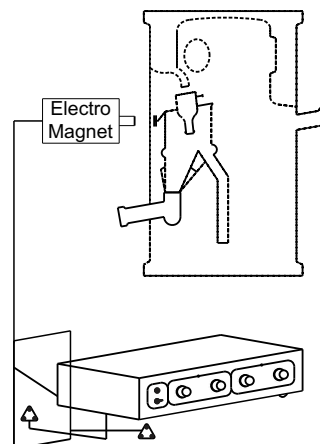


## MEASUREMENT AND CONTROL

### ELECTRO MAGNETIC CONTROLLER

This device is used for control of magnetic reflux dividers. They are fitted outside reflux divider near swinging funnel. When activated the magnet attracts the swinging funnel so that the distillate is taken out of the column. When deactivated the swinging funnel lets the distillate liquid reflux in to the column. The rate of distillate & reflux can be controlled with timers.

Type	Reference
Non-flameproof	SFRPM
Flameproof	SFRPF



### TIMER

This device is designed to use with electromagnetic controller to provide a desired ratio of distillate & reflux while using electro magnetically operated reflux divider.

Type	Reference
Non-flameproof	SFRPM
Flameproof	SFRPF

# COUPLINGS & GASKETS



## INTRODUCTION

SIGMA couplings are a strong & heavy-duty system that provides maximum reliability with minimum need for maintenance. This is achieved by use of easy to install corrosion resistant gaskets and carefully dimensioned individual parts of the coupling. The material of construction is selected based on the type of products being handled & the atmospheric conditions of installation area. For GMP application SS coupling with SS nuts & bolts are used.

The complete range of standard components available is described on the following pages. Non-standard components can also be supplied against special orders.

## COUPLINGS & GASKETS

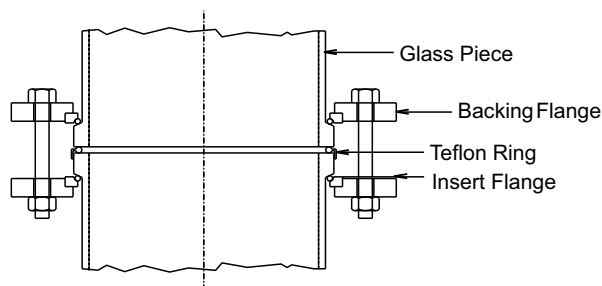
### COUPLINGS

Couplings are available to join borosilicate glass 3.3 plants & pipelines together. They are designed to ensure effective sealing of the joints & to avoid inducing any undue stress on the glass. Various grades are available for use in all kinds of service condition.

### COUPLINGS WITH CAST IRON FLANGES

These couplings are made of set of cast iron flanges, inserts with appropriate nuts & bolts. The insert used in couplings can be of neoprene rubber or asbestos with cast iron split ring as mentioned in the table.

Epoxy coated or powder coated cast iron flanges can be supplied against special request



DN	BACKING FLANGE with Rubber Insert		RUBBER INSERTS		NUTS & BOLTS			Complete Coupling with Rubber Insert
	Reference	QTY	Reference	QTY	D	L	QTY	Reference
25	SFCFO 1	2	SFCN 1	2	5/16"	2.5"	3	SFCTO 1
40	SFCFO 1.5	2	SFCN 1.5	2	5/16"	2.5"	3	SFCTO 1.5
50	SFCFO 2	2	SFCN 2	2	5/16"	3"	3	SFCTO 2
80	SFCFO 3	2	SFCN 3	2	5/16"	3.5"	6	SFCTO 3
100	SFCFO 4	2	SFCN 4	2	5/16"	4"	6	SFCTO 4
150	SFCFO 6	2	SFCN 6	2	5/16"	4"	6	SFCTO 6
225	SFCFO 9	2	SFCN 9	2	3/8"	5"	8	SFCTO 9
300	SFCFO 12	2	SFCN 12	2	3/8"	6"	12	SFCTO 12
400	SFCFO 16	2	SFCN 16	2	1/2"	8"	12	SFCTO 16
450	SFCFO 18	2	SFCN 18	2	1/2"	8"	12	SFCTO 18
600	SFCFO 24	2	SFCN 24	2	1/2"	8"	12	SFCTO 24

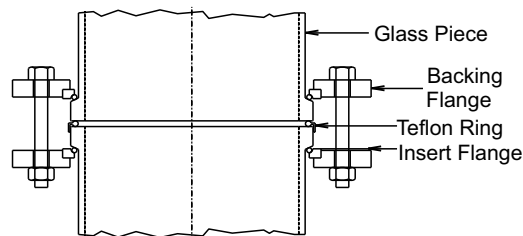
DN	BACKING FLANGE with C.I. Split & Asbestos		C.I. Split with Asbestos rop Insert		NUTS & BOLTS			Complete Coupling with C.I. Split & Asbestos
	Reference	QTY	Reference	QTY	D	L	QTY	Reference
25	SFCFX 1	2	SFCNA 1	2	5/16"	2.5"	3	SFCTX 1
40	SFCFX 1.5	2	SFCNA 1.5	2	5/16"	2.5"	3	SFCTX 1.5
50	SFCFX 2	2	SFCNA 2	2	5/16"	3"	3	SFCTX 2
80	SFCFX 3	2	SFCNA 3	2	5/16"	3.5"	6	SFCTX 3
100	SFCFX 4	2	SFCNA 4	2	5/16"	4"	6	SFCTX 4
150	SFCFX 6	2	SFCNA 6	2	5/16"	4"	6	SFCTX 6
225	SFCFX 9	2	SFCNA 9	2	3/8"	5"	8	SFCTX 9
300	SFCFX 12	2	SFCNA 12	2	3/8"	6"	12	SFCTX 12
400	SFCFX 16	2	SFCNA 16	2	1/2"	8"	12	SFCTX 16
450	SFCFX 18	2	SFCNA 18	2	1/2"	8"	12	SFCTX 18
600	SFCFX 24	2	SFCNA 24	2	1/2"	8"	12	SFCTX 24

# COUPLINGS & GASKETS

## COUPLINGS WITH STAINLESS STEEL FLANGES

These couplings are made of set of SS 304 flanges, inserts with SS 304 nuts & bolts. The insert used in couplings can be of neoprene rubber or asbestos with SS 304 split ring as mentioned in the table.

SS 316 flanges can also be supplied against special request.



DN	BACKING FLANGE with Rubber Insert		RUBBER INSERTS		NUTS & BOLTS			Complete Coupling with Rubber Insert
	Reference	QTY	Reference	QTY	D	L	QTY	Reference
25	SFCFO 1/SS	2	SFCN 1	2	5/16"	2.5"	3	SFCTO 1/SS
40	SFCFO 1.5/SS	2	SFCN 1.5	2	5/16"	2.5"	3	SFCTO 1.5/SS
50	SFCFO 2/SS	2	SFCN 2	2	5/16"	3"	3	SFCTO 2/SS
80	SFCFO 3/SS	2	SFCN 3	2	5/16"	3.5"	6	SFCTO 3/SS
100	SFCFO 4/SS	2	SFCN 4	2	5/16"	4"	6	SFCTO 4/SS
150	SFCFO 6/SS	2	SFCN 6	2	5/16"	4"	6	SFCTO 6/SS
225	SFCFO 9/SS	2	SFCN 9	2	3/8"	5"	8	SFCTO 9/SS
300	SFCFO 12/SS	2	SFCN 12	2	3/8"	6"	12	SFCTO 12/SS
400	SFCFO 16/SS	2	SFCN 16	2	1/2"	8"	12	SFCTO 16/SS
450	SFCFO 18/SS	2	SFCN 18	2	1/2"	8"	12	SFCTO 18/SS
600	SFCFO 24/SS	2	SFCN 24	2	1/2"	8"	12	SFCTO 24/SS

DN	BACKING FLANGE with C.I. Split & Asbestos		S.S. Split with Asbestos rop Insert		NUTS & BOLTS			Complete Coupling with S.S. Split & Asbestos
	Reference	QTY	Reference	QTY	D	L	QTY	Reference
25	SFCFX 1/SS	2	SFCNA 1/SS	2	5/16"	2.5"	3	SFCTX 1/SS
40	SFCFX 1.5/SS	2	SFCNA 1.5/SS	2	5/16"	2.5"	3	SFCTX 1.5/SS
50	SFCFX 2/SS	2	SFCNA 2/SS	2	5/16"	3"	3	SFCTX 2/SS
80	SFCFX 3/SS	2	SFCNA 3/SS	2	5/16"	3.5"	6	SFCTX 3/SS
100	SFCFX 4/SS	2	SFCNA 4/SS	2	5/16"	4"	6	SFCTX 4/SS
150	SFCFX 6/SS	2	SFCNA 6/SS	2	5/16"	4"	6	SFCTX 6/SS
225	SFCFX 9/SS	2	SFCNA 9/SS	2	3/8"	5"	8	SFCTX 9/SS
300	SFCFX 12/SS	2	SFCNA 12/SS	2	3/8"	6"	12	SFCTX 12/SS
400	SFCFX 16/SS	2	SFCNA 16/SS	2	1/2"	8"	12	SFCTX 16/SS
450	SFCFX 18/SS	2	SFCNA 18/SS	2	1/2"	8"	12	SFCTX 18/SS
600	SFCFX 24/SS	2	SFCNA 24/SS	2	1/2"	8"	12	SFCTX 24/SS

## QUICK RELEASE COUPLINGS

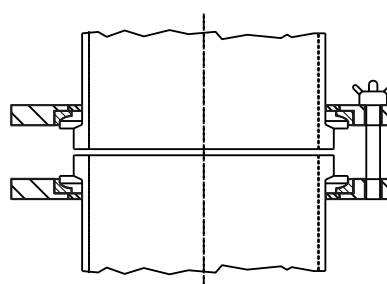
These couplings are used wherever there is need to open or close joints frequently. The advantage of using quick release couplings is that they can be opened and closed without use of any tools.

## CAST IRON QUICK RELEASE COUPLINGS

These couplings are made of cast iron upper flange with slotted bolt holes, hinged quick release bolt and lower backing flange.

Epoxy coated or powder coated cast iron flanges can also be supplied against special request.

DN	Reference
25	SFCVS 1
40	SFCVS 1.5
50	SFCVS 2
80	SFCVS 3
100	SFCVS 4
150	SFCVS 6
225	SFCVS 9
300	SFCVS 12



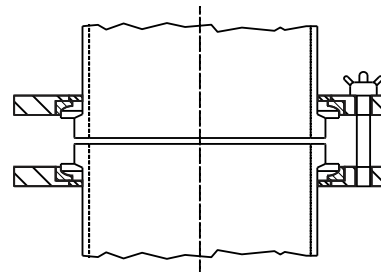
## COUPLINGS & GASKETS

### STAINLESS STEEL QUICK RELEASE COUPLINGS

These couplings are made of SS 304 upper flange with slotted bolt holes, hinged quick release bolt and lower backing flange.

SS 316 quick release couplings can also be supplied against special request.

DN	Reference
25	SFCVS 1/SS
40	SFCVS 1.5/SS
50	SFCVS 2/SS
80	SFCVS 3/SS
100	SFCVS 4/SS
150	SFCVS 6/SS
225	SFCVS 9/SS
300	SFCVS 12/SS



### BACKING FLANGES

Backing flanges can be supplied in variety of materials to complement complete couplings described earlier.

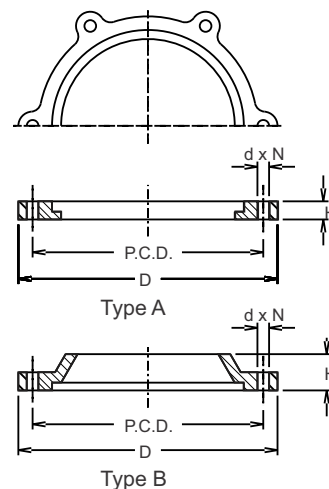
The diameter, number of bolt holes & PCD are identical for all types of the same nominal size providing high level of flexibility and ease of replacement and are used with inserts.

### CAST IRON BACKING FLANGES

These flange are made of cast iron. They are made of single piece design up to DN 450 and two-piece design for DN 600.

Epoxy coated or powder coated cast iron flanges can also be supplied against special request.

DN	D	H	P.C.D.	d x N	Type	Rubber Insert Reference	C.I. Split & Asbestos Reference
25	90	10	70	9 x 3	A	SFCFO 1	SFCFX 1
40	105	10	86	9 x 3	A	SFCFO 1.5	SFCFX 1.5
50	120	11	98	9 x 3	A	SFCFO 2	SFCFX 2
80	155	12	133	9 x 6	A	SFCFO 3	SFCFX 3
100	200	14	178	9 x 6	A	SFCFO 4	SFCFX 4
150	280	15	254	11 x 6	A	SFCFO 6	SFCFX 6
225	335	29	310	11 x 8	B	SFCFO 9	SFCFX 9
300	420	35	394	11 x 12	B	SFCFO 12	SFCFX 12
400	525	22	495	12 x 12	B	SFCFO 16	SFCFX 16
450	630	38	585	14 x 12	B	SFCFO 18	SFCFX 18
600	745	48	710	14 x 12	B	SFCFO 24	SFCFX 24



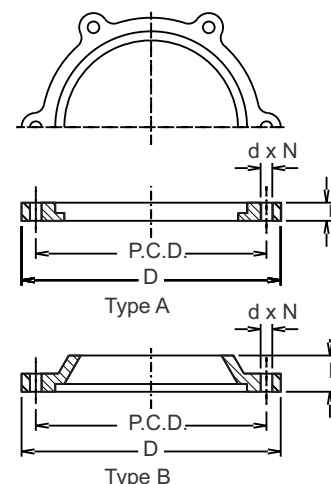
# COUPLINGS & GASKETS

## STAINLESS STEEL BACKING FLANGES

These flange are made of SS 304. They are made of single piece design up to DN 450 and two-piece design for DN 600.

SS 316 flanges can also be supplied against special request.

DN	D	H	P.C.D.	d x N	Type	Rubber Insert Reference	S.S. Split & Asbestos Reference
25	90	10	70	9 x 3	A	SFCFO 1/SS	SFCFX 1/SS
40	105	10	86	9 x 3	A	SFCFO 1.5/SS	SFCFX 1.5/SS
50	120	11	98	9 x 3	A	SFCFO 2/SS	SFCFX 2/SS
80	155	12	133	9 x 6	A	SFCFO 3/SS	SFCFX 3/SS
100	200	14	178	9 x 6	A	SFCFO 4/SS	SFCFX 4/SS
150	280	15	254	11 x 6	A	SFCFO 6/SS	SFCFX 6/SS
225	335	29	310	11 x 8	B	SFCFO 9/SS	SFCFX 9/SS
300	420	35	394	11 x 12	B	SFCFO 12/SS	SFCFX 12/SS
400	525	22	495	12 x 12	B	SFCFO 16/SS	SFCFX 16/SS
450	630	38	585	14 x 12	B	SFCFO 18/SS	SFCFX 18/SS
600	745	48	710	14 x 12	B	SFCFO 24/SS	SFCFX 24/SS

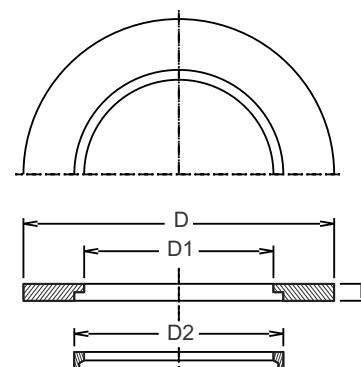


## ADAPTOR BACKING FLANGES

Adaptor flanges are useful when borosilicate glass 3.3 components are to be connected to flanges on equipments made in other materials of construction, with different PCD, bolt hole diameters and bolt configuration. They have larger outer diameter than standard backing flanges and can be supplied undrilled or drilled to required specifications.

Standard adaptor flanges are made of cast iron and supplied with insert. Special adaptor flanges made of aluminum; SS 304 and SS 316 are also available.

DN	D	D1	D2	H	Reference	Reference
25	115	43	51	10	SFCFA 1	SFCFA 1/SS
40	150	58	66	10	SFCFA 1.5	SFCFA 1.5/SS
50	165	70	81	12	SFCFA 2	SFCFA 2/SS
80	200	101	112	12	SFCFA 3	SFCFA 3/SS
100	220	134	148	12	SFCFA 4	SFCFA 4/SS
150	285	186	196	15	SFCFA 6	SFCFA 6/SS
225	395	260	282	15	SFCFA 9	SFCFA 9/SS
300	445	342	363	18	SFCFA 12	SFCFA 12/SS



Drilled to Table E			Drilled to Table F			Drilled to Table ASA 150		
Reference	PCD	n x dØ	Reference	PCD	n x dØ	Reference	PCD	n x dØ
SFCFA 1/E	82	4 x 12Ø	SFCFA 1/F	87	4 x 16Ø	SFCFA 1/A	79	4 x 12Ø
SFCFA 1.5/E	98	4 x 12Ø	SFCFA 1.5/F	105	4 x 16Ø	SFCFA 1.5/A	98	4 x 12Ø
SFCFA 2/E	114	4 x 16Ø	SFCFA 2/F	127	4 x 16Ø	SFCFA 2/A	121	4 x 16Ø
SFCFA 3/E	146	4 x 16Ø	SFCFA 3/F	165	8 x 16Ø	SFCFA 3/A	152	4 x 16Ø
SFCFA 4/E	178	8 x 16Ø	SFCFA 4/F	190	8 x 16Ø	SFCFA 4/A	190	8 x 16Ø
SFCFA 6/E	235	8 x 19Ø	SFCFA 6/F	260	12 x 19Ø	SFCFA 6/A	241	8 x 19Ø
SFCFA 9/E	324	12 x 19Ø	SFCFA 9/F	356	12 x 19Ø	SFCFA 9/A	298	8 x 19Ø
SFCFA 12/E	406	12 x 23Ø	SFCFA 12/F	438	16 x 23Ø	SFCFA 12/A	432	12 x 23Ø

# COUPLINGS & GASKETS

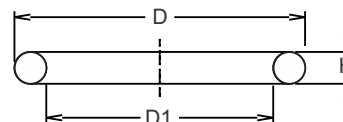
## INSERTS

Inserts are fitted to avoid direct contact between backing flange & glass buttress end. They also compensate for any unevenness from manufacturing tolerances. They should ideally be replaced when the joint is reassembled.

## RUBBER INSERTS

Neoprene rubber inserts can be used for temperature up to 123°C.

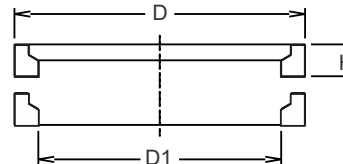
DN	D	D1	H	Reference
25	50	36	8	SFCN 1
40	65	50	8	SFCN 1.5
50	79	62	8	SFCN 2
80	110	92	8	SFCN 3
100	146	122	8	SFCN 4
150	197	174	10	SFCN 6
225	275	240	10	SFCN 9
300	359	322	10	SFCN 12
400	474	431	12	SFCN 16
450	555	500	18	SFCN 18
600	684	634	18	SFCN 24



## ASBESTOS INSERTS

These inserts are made of cast iron split ring with asbestos rop of required thickness. Insert with SS 304 split ring with Asbestos rop are available for use with SS backing Flanges.

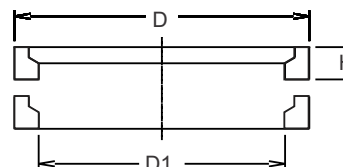
DN	D	D1	H	Reference	Reference for SS
25	50	36	8	SFCNA 1	SFCNA 1/SS
40	65	50	8	SFCNA 1.5	SFCNA 1.5/SS
50	79	62	8	SFCNA 2	SFCNA 2/SS
80	110	92	8	SFCNA 3	SFCNA 3/SS
100	146	122	8	SFCNA 4	SFCNA 4/SS
150	197	174	10	SFCNA 6	SFCNA 6/SS
225	275	240	10	SFCNA 9	SFCNA 9/SS
300	359	322	10	SFCNA 12	SFCNA 12/SS
400	474	431	12	SFCNA 16	SFCNA 16/SS
450	555	500	18	SFCNA 18	SFCNA 18/SS
600	684	634	18	SFCNA 24	SFCNA 24/SS



## PTFE ROPE INSERTS

For use in GMP condition & clean room application, insert with SS 304 split ring with PTFE impregnated rope are available for use with SS backing flanges.

DN	D	D1	H	Reference
25	50	36	8	SFCNP 1
40	65	50	8	SFCNP 1.5
50	79	62	8	SFCNP 2
80	110	92	8	SFCNP 3
100	146	122	8	SFCNP 4
150	197	174	10	SFCNP 6
225	275	240	10	SFCNP 9
300	359	322	10	SFCNP 12
400	474	431	12	SFCNP 16
450	555	500	18	SFCNP 18
600	684	634	18	SFCNP 24

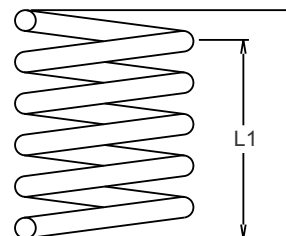


# COUPLINGS & GASKETS

## COMPRESSION SPRINGS

Compression springs are used to set the correct bolt load and to maintain it even after gasket has settled ensuring that the coupling remains leak free. They are supplied exclusively in stainless steel.

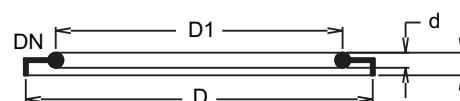
DN	FREE L	INSTALLED L1	Reference
25 - 100	14.5	11.0	SFDF 8.5
150 - 300	22.0	18.0	SFDF 10.5
450 - 600	28.7	22.7	SFDF 13



## PTFE 'O' RING GASKETS WITH LOCKING COLLAR

This is most widely used type of gasket. It is a self-centering design, which is easy to install and aligns correctly in the joint.

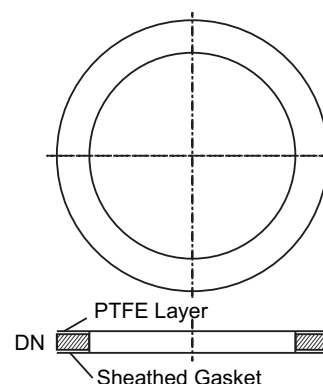
DN	D	D1	d	L	Reference
25	42	33	3	5	SFTR 1
40	57	48	3	5	SFTR 1.5
50	70	59	3	5	SFTR 2
80	100	88	3	5	SFTR 3
100	134	119	4	6	SFTR 4
150	186	168	4	6	SFTR 6
225	260	236	4	7	SFTR 9
300	342	318	4	7	SFTR 12
400	467	435	6	7	SFTR 16
450	537	490	6	7	SFTR 18
600	686	640	8	10	SFTR 24



## PTFE ENVELOPE GASKETS

These gaskets are formed by provided outer PTFE envelop over compressed asbestos fiber core.

DN	Reference
25	SFTM 1
40	SFTM 1.5
50	SFTM 2
80	SFTM 3
100	SFTM 4
150	SFTM 6
225	SFTM 9
300	SFTM 12
400	SFTM 16
450	SFTM 18
600	SFTM 24



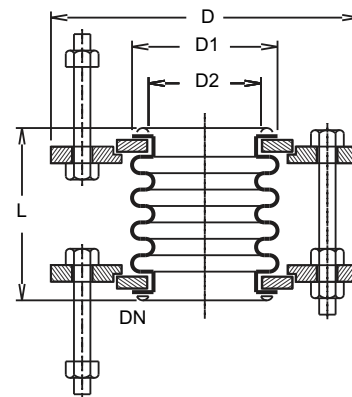
## COUPLINGS & GASKETS

### PTFE BELLOWS

Bellows are important elements in construction of borosilicate glass 3.3 plants & pipeline. They are mainly used to [1] compensate for expansion and contraction due to change in temperature [2] to avoid stress in plant [3] absorb vibrations from service lines, pumps etc. The maximum operating temperature for these bellow is 180° C

### PTFE BELLOWS GLASS TO GLASS (LINE BELLOW)

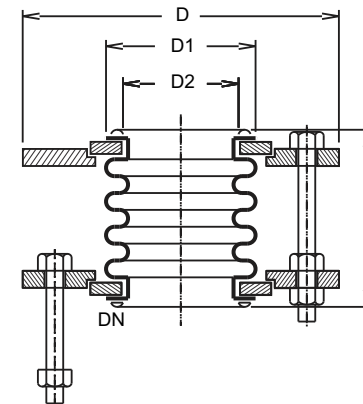
DN	D	D1	D2	L	Reference
25	90	41	31	60	SFFBN 1
40	105	56	43	60	SFFBN 1.5
50	121	69	55	60	SFFBN 2
80	155	98	82	65	SFFBN 3
100	200	132	111	65	SFFBN 4
150	274	184	162	65	SFFBN 6
225	340	258	230	65	SFFBN 9
300	425	340	308	65	SFFBN 12



### PTFE BELLOWS GLASS TO OTHER MATERIALS (LINE BELLOW)

Adaptor flanges is supplied with this bellow so that it can be drilled as per the configuration of mating flange. However, this adaptor bellow flange can be supplied drilled AS per "Table E", "Table F", or "ASA 150" standards, if Specified.

DN	D	D1	D2	L	Reference
25	115	41	31	60	SFFBF 1
40	150	56	43	60	SFFBF 1.5
50	165	69	55	60	SFFBF 2
80	200	98	82	65	SFFBF 3
100	220	132	111	65	SFFBF 4
150	285	184	162	65	SFFBF 6
225	395	258	230	65	SFFBF 9
300	445	340	308	65	SFFBF 12

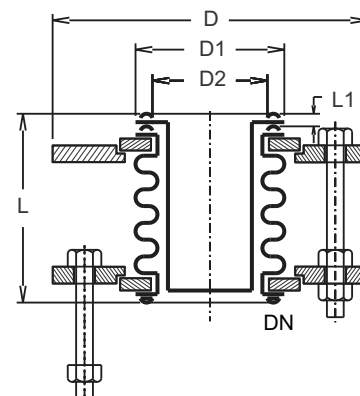


### PTFE VACUUM BELLOWS GLASS TO GLASS (VACUUM BELLOW)

For pipelines of 80DN and above operating under vacuum, the bellows are provided with an internal sleeve which supports the convolutions without affecting the flexibility of the bellow. These bellows can withstand a temperature of 180°C under full vacuum.

For size upto 50DN, line bellows can be used for these applications.

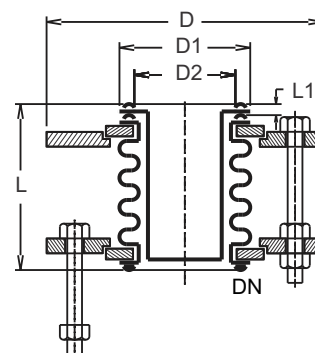
DN	D	D1	D2	L	L1	Reference
80	155	98	82	70	5	SFVBN 3
100	200	132	111	70	5	SFVBN 4
150	274	184	162	70	5	SFVBN 6
225	340	258	230	70	5	SFVBN 9
300	425	340	308	70	5	SFVBN 12



# COUPLINGS & GASKETS

## PTFE VACUUM BELLOWS GLASS TO OTHER MATERIALS (VACUUM BELLOW)

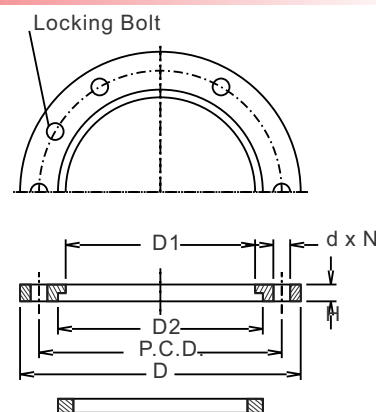
DN	D	D1	D2	L	L1	Reference
80	200	98	82	70	5	SFVBF 3
100	220	132	111	70	5	SFVBF 4
150	285	184	162	70	5	SFVBF 6
225	395	258	230	70	5	SFVBF 9
300	445	340	308	70	5	SFVBF 12



## CAST IRON BELLOWS FLANGES

These are made of cast iron and supplied with split ring. These are provided with two holes at 180° for distance locking bolts.

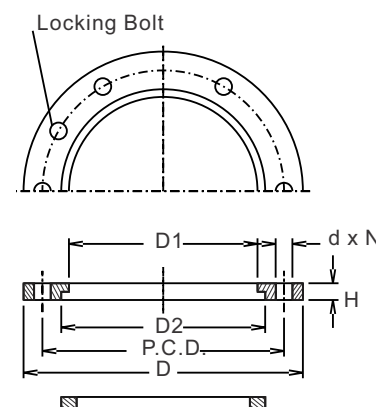
DN	D	D1	D2	PCD	d X N	H	Reference
25	90	44	54	70	9 x 3	8	SFBF 1
40	105	59	66	86	9 x 3	9	SFBF 1.5
50	121	71	80	98	9 x 3	10	SFBF 2
80	155	102	115	133	9 x 6	10	SFBF 3
100	200	135	146	178	9 x 6	10	SFBF 4
150	274	186	202	254	10 x 6	10	SFBF 6
225	340	260	275	310	10 x 8	11	SFBF 9
300	425	340	363	394	11 x 12	15	SFBF 12



## ALUMINUM BELLOWS FLANGES

These are made of aluminum and supplied with split ring. These are provided with two holes at 180° for distance locking bolts. The advantage of this flange is of reduced weight load on the system.

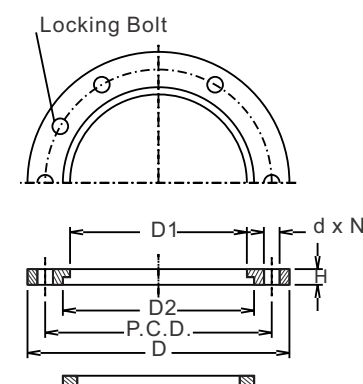
DN	D	D1	D2	PCD	d X N	H	Reference
25	90	44	54	70	9 x 3	8	SFBF 1/ALU
40	105	59	66	86	9 x 3	9	SFBF 1.5/ALU
50	121	71	80	98	9 x 3	10	SFBF 2/ALU
80	155	102	115	133	9 x 6	10	SFBF 3/ALU
100	200	135	146	178	9 x 6	10	SFBF 4/ALU
150	274	186	202	254	10 x 6	10	SFBF 6/ALU
225	340	260	275	310	10 x 8	11	SFBF 9/ALU
300	425	340	363	394	11 x 12	15	SFBF 12/ALU



## STAINLESS STEEL BELLOW FLANGES

These are made of stainless steel and supplied with split ring. These are provided with two holes at 180° for distance locking bolts.

DN	D	D1	D2	PCD	d X N	H	Reference
25	90	44	54	70	9 x 3	8	SFBF 1/SS
40	105	59	66	86	9 x 3	9	SFBF 1.5/SS
50	121	71	80	98	9 x 3	10	SFBF 2/SS
80	155	102	115	133	9 x 6	10	SFBF 3/SS
100	200	135	146	178	9 x 6	10	SFBF 4/SS
150	274	186	202	254	10 x 6	10	SFBF 6/SS
225	340	260	275	310	10 x 8	11	SFBF 9/SS
300	425	340	363	394	11 x 12	15	SFBF 12/SS



## COUPLINGS & GASKETS

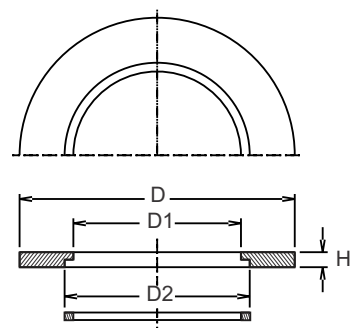
### ADAPTOR BELLOW FLANGES

Adaptor bellow flanges are useful when borosilicate glass 3.3 components with bellow are to be connected to flanges on equipments made in other materials of construction, with different PCD, bolt hole diameters and bolt configuration. They have larger outer diameter than standard bellow flanges and can be supplied undrilled or drilled to required specifications.

### CAST IRON ADAPTOR BELLOW FLANGES

These are made of cast iron and supplied with split ring

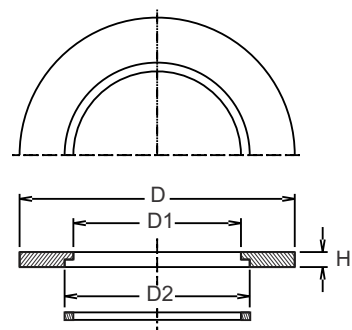
DN	D	D1	D2	H	Reference
25	115	44	53	7	SFBFA 1
40	150	59	65	9	SFBFA 1.5
50	165	70	81	9	SFBFA 2
80	200	104	115	9	SFBFA 3
100	220	133	149	9	SFBFA 4
150	285	189	204	11	SFBFA 6
225	395	261	280	12	SFBFA 9
300	445	342	363	12	SFBFA 12



### ALUMINUM ADAPTOR BELLOW FLANGES

These are made of Aluminum and supplied with split ring. The advantage of this flanges is of reduced weight load on the system

DN	D	D1	D2	H	Reference
25	115	44	53	7	SFBFA 1/ALU
40	150	59	65	9	SFBFA 1.5/ALU
50	165	70	81	9	SFBFA 2/ALU
80	200	104	115	9	SFBFA 3/ALU
100	220	133	149	9	SFBFA 4/ALU
150	285	189	204	11	SFBFA 6/ALU
225	395	261	280	12	SFBFA 9/ALU
300	445	342	363	12	SFBFA 12/ALU

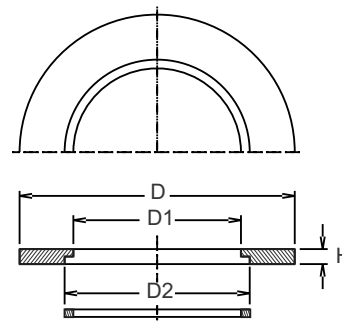


# COUPLINGS & GASKETS

## STAINLESS STEEL ADAPTOR BELLOW FLANGES

These are made of stainless steel and supplied with split ring

DN	D	D1	D2	H	Reference
25	115	44	53	7	SFBFA 1/SS
40	150	59	65	9	SFBFA 1.5/SS
50	165	70	81	9	SFBFA 2/SS
80	200	104	115	9	SFBFA 3/SS
100	220	133	149	9	SFBFA 4/SS
150	285	189	204	11	SFBFA 6/SS
225	395	261	280	12	SFBFA 9/SS
300	445	342	363	12	SFBFA 12/SS



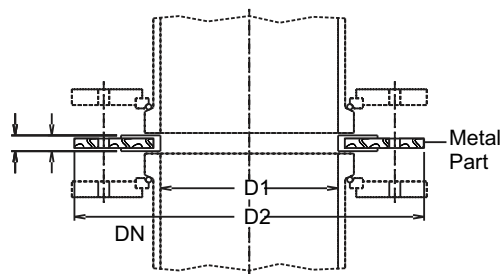
Drilled to Table E			Drilled to Table F			Drilled to ASA 150		
Reference	PCD	n x dØ	Reference	PCD	n x dØ	Reference	PCD	n x dØ
SFBFA 1/E	82	4 x 12Ø	SFBFA 1/F	87	4 x 16Ø	SFBFA 1/A	79	4 x 12Ø
SFBFA 1.5/E	98	4 x 12Ø	SFBFA 1.5/F	105	4 x 16Ø	SFBFA 1.5/A	98	4 x 12Ø
SFBFA 2/E	114	4 x 16Ø	SFBFA 2/F	127	4 x 16Ø	SFBFA 2/A	121	4 x 16Ø
SFBFA 3/E	146	4 x 16Ø	SFBFA 3/F	165	8 x 16Ø	SFBFA 3/A	152	4 x 16Ø
SFBFA 4/E	178	8 x 16Ø	SFBFA 4/F	190	8 x 16Ø	SFBFA 4/A	190	8 x 16Ø
SFBFA 6/E	235	8 x 19Ø	SFBFA 6/F	260	12 x 19Ø	SFBFA 6/A	241	8 x 19Ø
SFBFA 9/E	324	12 x 19Ø	SFBFA 9/F	356	12 x 23Ø	SFBFA 9/A	298	8 x 19Ø
SFBFA 12/E	406	12 x 23Ø	SFBFA 12/F	438	16 x 23Ø	SFBFA 12/A	432	12 x 23Ø

## COUPLINGS & GASKETS

### ADAPTOR PLATE FOR REACTORS

Adaptor plates are used as interface when connecting glass flat buttress end components to glass-lined reactor. A combination of steel rubber & PTFE envelop provide an ideal sealing surface with only PTFE coming in contact with process fluids/gases giving excellent resistance to corrosion.

DN	D1	D2	L	Reference
25	25	60	10	SFEMP 1
40	37	80	10	SFEMP 1.5
50	50	100	10	SFEMP 2
80	75	120	12	SFEMP 3
100	100	155	12	SFEMP 4
150	150	210	12	SFEMP 6
225	200	260	15	SFEMP 9
300	300	360	15	SFEMP 12



# TUBULAR SUPPORTING STRUCTURE



## INTRODUCTION

SIGMA structures are designed to support plant and other equipments in borosilicate glass 3.3. These structures are available in the form of modular system that not only meet standard requirement but also facilitate solutions for problems of unique nature. These structures consist of steel tubings, which are connected using the appropriate fittings. As a result these structure can be assembled, dismantled, expanded or modified very easily & quickly. Standard support is made of G.I. tubes with C.I. fittings. For GMP application SS pipes with SS fittings are used.

# TUBULAR SUPPORTING STRUCTURE

## TUBE SIZE

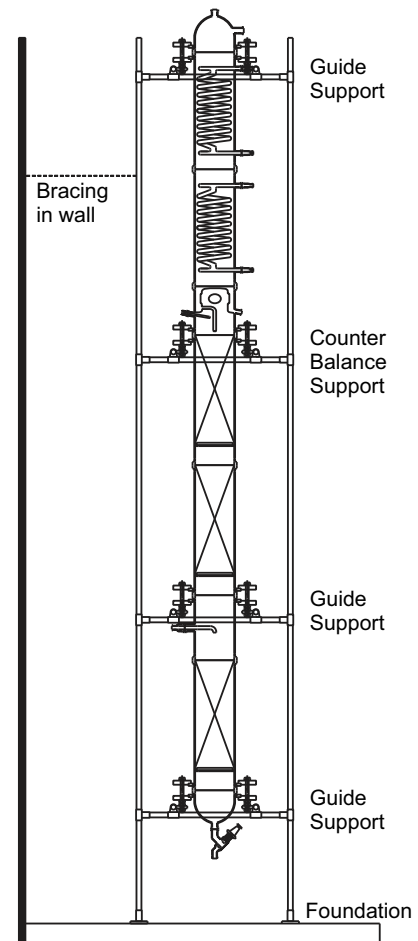
Since there are various terminologies in common uses to determine tube size, the following table is given to compare and relate them to the fitting size reference.

TUBE INCHES DIAMETER	NOMINAL BORE mm	EXTERNAL DIAMETER mm
1/2"	15	19.5
1"	25	32.5
1 1/4"	30	41.5
1 1/2"	40	48.3
2"	50	60.3

## SUPPORTING COLUMN

In the design of tubular structure to support glass process plant and pipeline equipment, a number of basic rules should be followed.

- \* The structure should be stiff and should always be braced back to the nearest building or other stiff feature to give lateral support.
- \* All glass units are built up from a fixed point on which whole weight of the column should be taken. If a total load exceeds the allowable limits, counter balance supports should be used to relieve excessive weight
- \* All Glass unit and their structures expand at different rate as a result of change in temperature. The unit must, therefore, not be subjected to any vertical restraint above the fixed point. Due to this guide are used which give lateral support without affecting vertical movement of the glass relative to the supporting structure. The distance between guide frames must not exceed 3meters.



# TUBULAR SUPPORTING STRUCTURE

## STRUCTURES FITTINGS

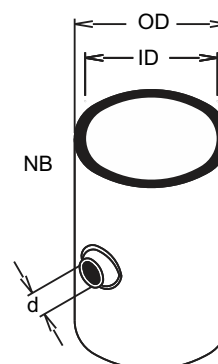
Following structure fittings are available to use with galvanized Iron or SS tubes in order to form a tubular structure of a glass plant. This fittings are made of cast iron and stainless steel are suitable to the tubes described as earlier.

These slidable fittings are provided with grub screws to fix it at required position on tubes.

These fittings are specially made to provide enough flexibility for future modification without involving any hammering and welding.

## GENERAL DATA

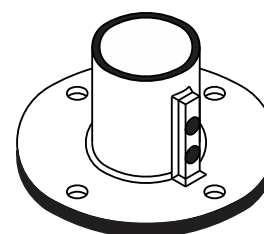
NB	TUBE DIA	ID	OD	d
25	32.5	35	45	1/2"
30	42.5	45	55	1/2"
40	48.3	51	61	1/2"
50	60.3	63	73	1/2"



## BASE

These are to be used with vertical tubes. Holes are provided for foundation.

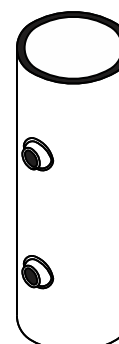
NB	Reference For C.I.	Reference For S.S.
25	SFBS 25	SFBS 25/SS
30	SFBS 30	SFBS 30/SS
40	SFBS 40	SFBS 40/SS
50	SFBS 50	SFBS 50/SS



## COUPLER

These are generally used to couple the vertical tubes where more length is require.

NB	Reference For C.I.	Reference For S.S.
25	SFCL 25	SFCL 25/SS
30	SFCL 30	SFCL 30/SS
40	SFCL 40	SFCL 40/SS
50	SFCL 50	SFCL 50/SS

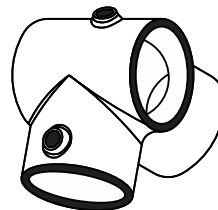


o s 0 s j Zp 2p s n n n p r g o 2p r p s a r s p o

## BEND

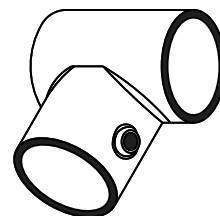
These are used to build frames on vertical tubes.

NB	Reference for C.I.	Reference for S.S.
25	S7BN 25	S7BN 25/SS
30	S7BN 30	S7BN 30/SS
40	S7BN 40	S7BN 40/SS
50	S7BN 50	S7BN 50/SS



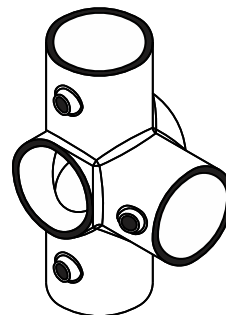
## TEE

NB	Reference for C.I.	Reference for S.S.
25	S7T 25	S7T 25/SS
30	S7T 30	S7T 30/SS
40	S7T 40	S7T 40/SS
50	S7T 50	S7T 50/SS



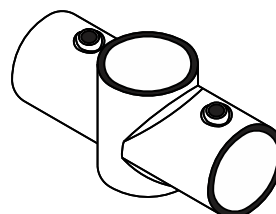
## DOUBLE BEND

NB	Reference for C.I.	Reference for S.S.
25	S7DB 25	S7DB 25/SS
30	S7DB 30	S7DB 30/SS
40	S7DB 40	S7DB 40/SS
50	S7DB 50	S7DB 50/SS



## DOUBLE TEE

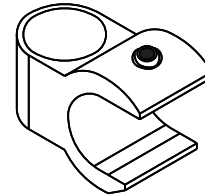
NB	Reference for C.I.	Reference for S.S.
25	S7DT 25	S7DT 25/SS
30	S7DT 30	S7DT 30/SS
40	S7DT 40	S7DT 40/SS
50	S7DT 50	S7DT 50/SS



# TUBULAR SUPPORTING STRUCTURE

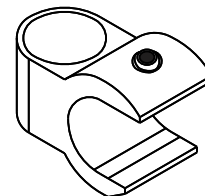
## EQUAL BRACKET

NB	Reference For C.I.	Reference For S.S.
25	SFEBT 25	SFEBT 25/SS
30	SFEBT 30	SFEBT 30/SS
40	SFEBT 40	SFEBT 40/SS
50	SFEBT 50	SFEBT 50/SS



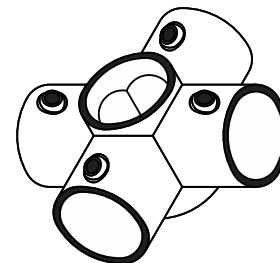
## UNEQUAL BRACKET

NB	Reference For C.I.	Reference For S.S.
25	SFUBT 25/15	SFUBT 25/15/SS
30	SFUBT 30/15	SFUBT 30/15/SS
30	SFUBT 30/25	SFUBT 30/25/SS
40	SFUBT 40/25	SFUBT 40/25/SS
50	SFUBT 50/25	SFUBT 50/25/SS



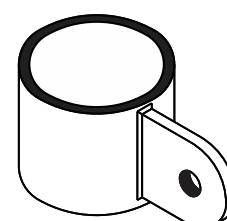
## CROSS

NB	Reference For C.I.	Reference For S.S.
25	SFX 25	SFX 25/SS
30	SFX 30	SFX 30/SS
40	SFX 40	SFX 40/SS
50	SFX 50	SFX 50/SS



## SUPPORT

NB	Reference For C.I.	Reference For S.S.
15	SFSPT 15	SFSPT 15/SS
25	SFSPT 25	SFSPT 25/SS
30	SFSPT 30	SFSPT 30/SS
40	SFSPT 40	SFSPT 40/SS
50	SFSPT 50	SFSPT 50/SS

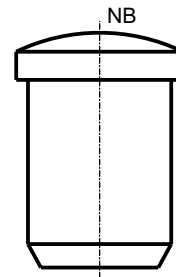


# TUBULAR SUPPORTING STRUCTURE

## PLUGS

These are used to plug the open ends of galvanised tubes.

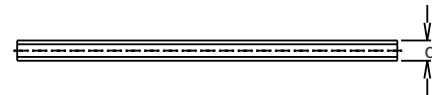
NB	Reference For C.I.	Reference For S.S.
15	SFPL 15	SFPL 15/SS
25	SFPL 25	SFPL 25/SS
30	SFPL 30	SFPL 30/SS
40	SFPL 40	SFPL 40/SS
50	SFPL 50	SFPL 50/SS



## STUDS

These are used as screwed rods with supports

d	Reference For C.I.	Reference For S.S.
5/6"	SFST 5/16-200	SFST 5/16-200/SS
3/8"	SFST 3/8-200	SFST 3/8-200/SS
1/2"	SFST 1/2-200	SFST 1/2-200/SS

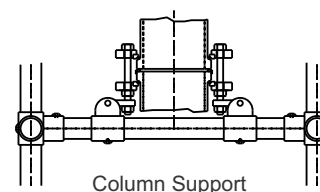
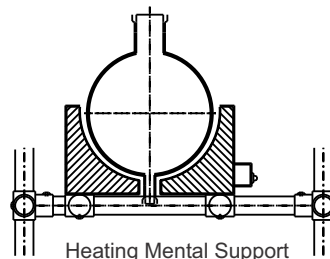
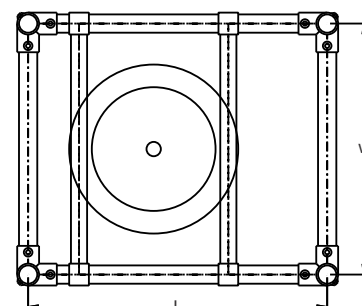
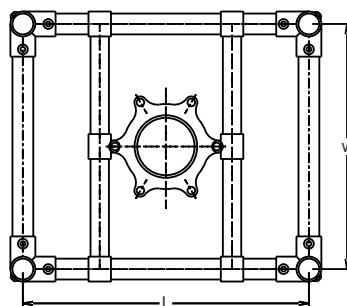


## GRUB SCREW

NB	Reference For C.I.	Reference For S.S.
15	SFGS 15	SFGS 15/SS

## STRUCTURE DIMENSION

Column	Cylindrical Vessels	Spherical Vessel Contents	Structure
DN	DN	Ltr	L x W
80	-	-	400 x 400
100	-	-	500 x 500
150	-	5,10	600 x 600
225	-	20	700 x 700
300	450	50	800 x 800
450	600	100,200	1000 x 1000
600	-	-	1100 x 1100

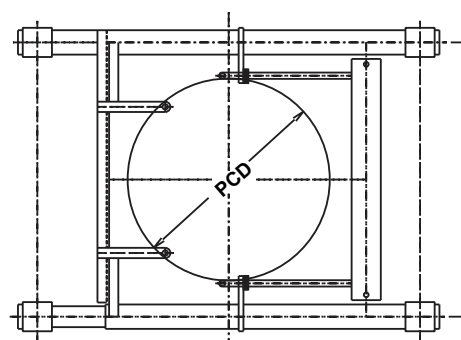
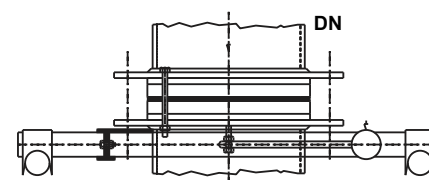


# TUBULAR SUPPORTING STRUCTURE

## COUNTER BALANCE SUPPORTS

When the total weight of the column is more and it can not be supported on fix support at the bottom, excessive weight is relieved by counter balance supports. The maximum load which can be supported on fix support and minimum force require to support the sealing of coupling are as under.

DN of Column	Permissible weight (kgs)	Force require for sealing (kgs)
225	200	25
300	380	35
400	500	55
450	700	70
600	1000	110



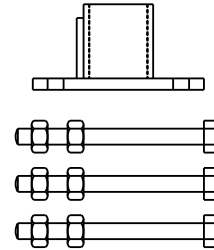
The counter weight acts through two levers on the lower backing flange. The maximum lever ratio is 1:10. More than one counter balance supports can be used to relieve the excessive load keeping minimum force required to support the sealing of coupling.

PCD	L	Reference
310	800	SFLCB 225
395	800	SFLCB 300
495	1000	SFLCB 400
585	1000	SFLCB 450
710	1200	SFLCB 600

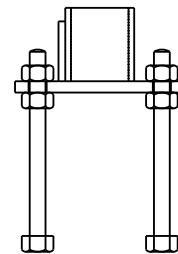
# TUBULAR SUPPORTING STRUCTURE

## GROUTING OF BASE

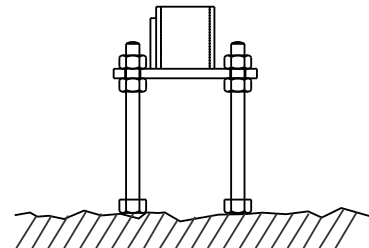
1.  
Take one Cast Iron BASE and four foundation Boltes, each with 2 nuts.



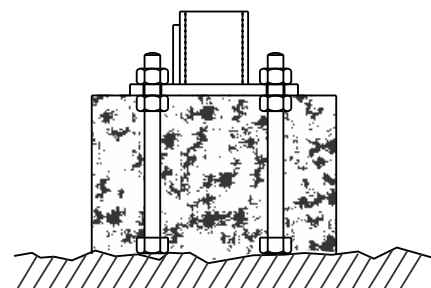
2.  
Fit the bolts in BASE so that base is raised upto 150mm from head of bolts.



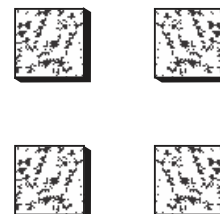
3.  
Put this assembly on the floor and prepare a rough surface for proper bonding of grouting.



4.  
Make a Concrete block over the bolts of about 200 x 200 mm upto the base of BASE i.e. 150 mm high.



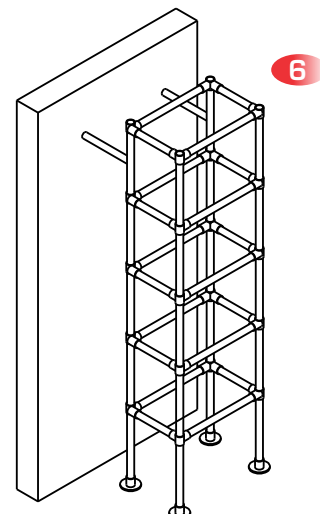
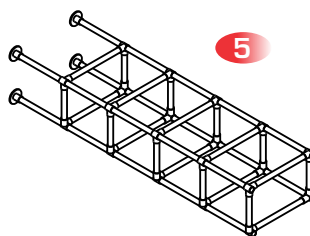
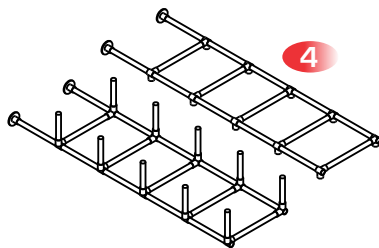
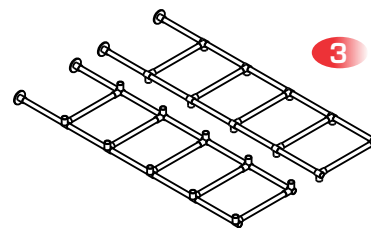
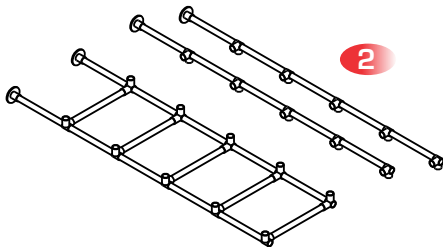
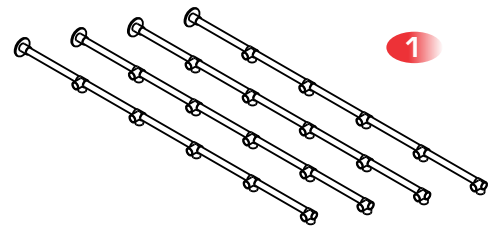
5.  
Prepare separate block for each BASE instead of making one big common block. For all BASES.



# TUBULAR SUPPORTING STRUCTURE

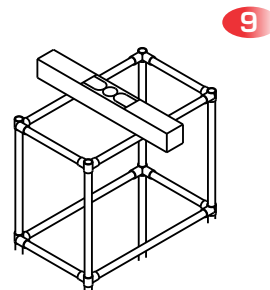
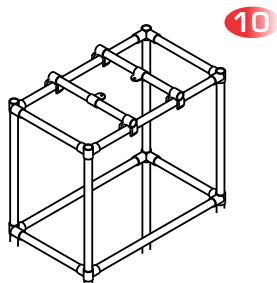
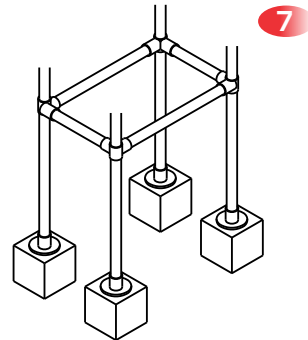
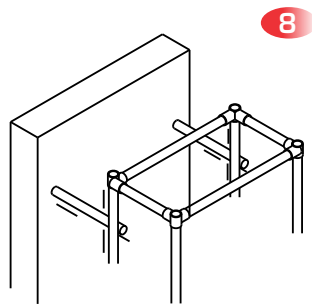
## ASSEMBLING OF STRUCTURE

1. Mark the position of required fittings on all the Vertical tubes, slide them in correct sequence and lightly Tighten.
2. Assemble one side frame of the structure by adding the cross tubes between two vertical tubes.
3. Assemble other side frame of the structure by adding the cross tubes between other two vertical tubes.
4. Build up the cross tubes in one side frame and Tighten lightly.
5. Add the other side frame on it and tighten all the fittings firmly.
6. Hoist the structure and brace it to some existing rigid feature.
7. Grout the foundation bolts and fix the structure bases with that.
8. Adjust bracing to obtain a correct plumb in structure.
9. Adjust the horizontal frames in correct level.
10. Assemble the support tubes at their positions.



# TUBULAR SUPPORTING STRUCTURE

## ASSEMBLING OF STRUCTURE



## QUALITY POLICY

WE AT **SIGMA SCIENTIFIC GLASS PVT. LTD.**  
ARE COMMITTED TO.

- ☐ MEET CUSTOMER REQUIREMENTS & SATISFACTORY BY PROVIDING SERVICES ON TIME. EVERY TIME.
- ☐ MANUFACTURE HIGH QUALITY BOROSILICATE GLASS 3.3 INDUSTRIAL PROCESS EQUIPMENT AND PLANTS. THAT IS FIT TO USE AND DURABLE.
- ☐ ACHIEVE & MAINTAIN HIGH STANDARDS OF QUALITY MANAGEMENT SYSTEM BY EMPLOYEE MOTIVATION, PARTICIPATION & BRING CONTINUAL IMPROVEMENT IN THE SYSTEM.

Date: 01/07/2007  
Place: Ankleshwar

  
**DHARMENDRA M. PATEL**  
Managing Director



**Sigma Scientific Glass Pvt. Ltd.**  
4606, G.I.D.C. Ankleshwar - 393 002 INDIA

Phone : +91 2646 225326, 226629

Fax

Email : [info@sigmaglassindia.com](mailto:info@sigmaglassindia.com)

Web : [www.sigmaglassindia.com](http://www.sigmaglassindia.com)

## CERTIFICATE

Management system as per  
ISO 9001 : 2000

In accordance with TUV INDIA procedures, it is hereby certified that

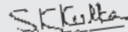
**SIGMA SCIENTIFIC GLASS PVT. LTD.**  
4606, GIDC, Ankleshwar - 393 002.  
Gujarat, India

applies a quality system in line with the above standard for the following scope

**Manufacturing & Supply of Scientific & Industrial Glass Equipment**

Valid until 29.11.2010

Certificate Registration No. QM 02 00175  
Audit Report No. Q 1602/2007



Mumbai, 19.12.2007

TUV INDIA Certification Body

This certification was conducted in accordance with the TUV INDIA auditing and certification procedures and is subject to regular surveillance audits.  
TUV India Pvt. Ltd., 801, Raheja Plaza - 1, L.B.S. Marg, Ghatkopar (W), Mumbai - 400 086, India [www.tuvindia.co.in](http://www.tuvindia.co.in)



## **Sigma** Scientific Glass Pvt. Ltd.

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