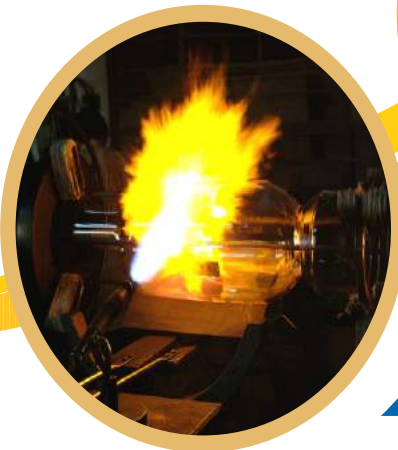
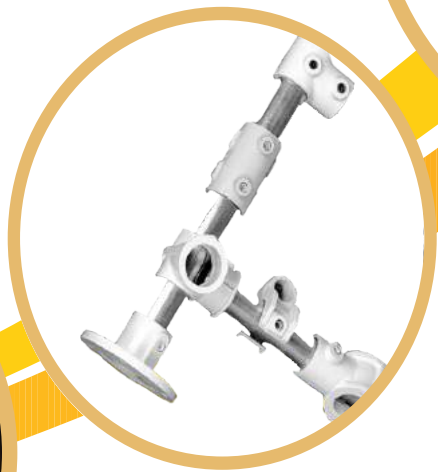




SINGHAL

SINGLA SCIENTIFIC GLASS INDUSTRIES



Product Catalogue

ABOUT US

Singla Scientific Glass Industries, based in Vadodara, Gujarat. Our company is a fast growing Company Engaged in Manufacturing of Borosilicate Glass 3.3 Industrial Process Plant Equipment. Our Mechanical engineering has set a standard in the industry for more than 20 years. The industry expertise, attitude and enthusiasm of the Employees of Singla Scientific Glass Industries from the Motto "**We are Glass People**".

Being the one - for Project Management, Production Optimizing and High Performance Equipment. Being the one stands for market leadership and complete solutions. It particularly stands for the people. Singla Scientific Glass Industries - being the one.

We are Glass People - with experience and passion heading for highest results. Our mission stands for Customer's Satisfaction, Product's Excellence and within Time Execution.

ABOUT DIRECTOR









What we see today are but reflections of Tomorrow. Not surprisingly then, the potential for future growth is rooted in the strength of today's foundations. Our Improved Performance is this a clear indication that we are on the right path to future progress. The idea of forming Singla Scientific Glass Industries was conceived by Mr. Rakesh Singla, who has a vast experience in this industry. More than 20 years, very young and dynamic personality and lively natured.

Mr. Rakesh Singla started his career with starting a company of Glass Blowing for making of glass Equipment of process plants, as an active Partner and Managing Director of the company, and he got a lot of Experience of making equipment, executions of the equipment, installation of plants and maintaining all the jobs on time without any complaint and look after their execution must be on time.

And now Mr. Rakesh Singla provide excellent Glass Blowing facility to provide to the requirements of Quality, Reliability, and Service & Support as per International Standards with the vast vision, dedicated team of employees and a sense of mission, the company was formed in the year 2002.

This was just a beginning of a long march and on the way following landmarks were left behind.

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TECHNICAL INFORMATION

GLASS COMPONENTS & PROCESS

PLANT IN BOROSILICATE GLASS 3.3

All Glass items shown in this catalogue are manufactured from borosilicate glass 3.3 and are widely used as the basis for the construction of complete process systems all over the chemical, dyestuff, food pharmaceutical, and petrochemical industries. The abbreviation for the coefficient of linear expansion which is $(3.3 \pm 0.1) \times 10^{-6} \text{K}^{-1}$. This is lower than any other industrial glass. Since this glass expands less, the tensile stresses in the glass wall during heating are less, which means that it is able to withstand a greater thermal shock and the maximum working pressure for a given operating temperature is greater.

One reason for this widespread use is the special properties of borosilicate glass 3.3 (see below), complemented by the use of other highly corrosion resistant materials such as PTFE and ceramics.

CHEMICAL COMPOSITION OF BOROSILICATE GLASS 3.3

Component	% by weight
SiO ₂	80.6
B ₂ O ₃	12.5
Na ₂ O	4.2
Al ₂ O ₃	2.2
Others	0.5

RESISTANCE TO CHEMICAL

Borosilicate glass 3.3 is highly resistant to water, neutral and acid solutions, concentrated acids and acid mixtures, and to chlorine, bromine, iodine and organic substances. The chemical resistance of this glass is superior to that of most metals and other materials, even when exposed to long processing periods and temperatures above 100°C. At higher temperatures and in more concentrated forms the glass surface is subject to increased attack by hydrofluoric acid, hot phosphoric acid and alkaline solutions.

PROPERTIES OF BOROSILICATE GLASS 3.3

The very large use of this material throughout the world in the chemical and pharmaceutical industries as well as many other allied areas, is mainly due to its chemical and thermal properties (see also ISO 3585) together with a great number of other benefits that make a distinction borosilicate glass 3.3 from other materials of construction. These include special properties e.g.

- Smooth non-porous surface
- Transparency
- Outstanding corrosion resistance
- No adverse physiological properties
- Neutral smell and taste
- Non-flammability
- Catalytic inertness.

PHYSICAL PROPERTIES

Borosilicate glass 3.3 differs from other materials of construction used for process plant not only because of its virtually universal resistance to corrosion but also because of its very low thermal expansion coefficient. There is, therefore no need for expensive measures to compensate for thermal expansion resulting from changes in temperature. This becomes of particular significance in the layout of long runs of glass pipeline.

The most important physical properties for the construction of plant are listed below (see also ISO 3585 and EN 1595).

Coefficient of linear thermal expansion 20/300°C	$(3.3 \pm 0.1) \times 10^{-6} \text{ K}^{-1}$
Thermal conductivity between 20 and 200°C	$1.3 \text{ W m}^{-1} \text{ K}^{-1}$
Specific heat capacity between 20 and 100°C	$0.8 \text{ kJ kg}^{-1} \text{ K}^{-1}$
Specific heat capacity between 20 and 200°C	$0.9 \text{ kJ kg}^{-1} \text{ K}^{-1}$

MECHANICAL PROPERTIES

The required ductility of glass prevent the equalization of stresses at local irregularity or flaw and the breakage strength varies considerably about a mean value. This latter is found to occur at a tensile strength of about 700kg/cm²

In order to allow for the spread of breaking stress, the safety factor is applied when determining the wall thickness requirement to allow operation up to values given in the table of working pressure.

Density	$2.23 \times 10^3 \text{ Kg/m}^3$
Modulus of elasticity E	$6500 / \text{mm}^2$
Permissible Tensile and bending stress K/S	6 N /mm^2
Permissible Compressive stress K/S	100 N mm^{-2}
Poisson's ratio (transverse contraction figure) \$	0.2

OPTICAL PROPERTIES

Borosilicate glass 3.3 shows no considerable light absorption in the visible area of the spectrum, and consequently it is clear and colorless.

Borosilicate glass 3.3 in photochemical processes the transparency of ultra violet is of particular importance. It follows from the transmittance of material in ultra violet region that photochemical reactions e.g. chlorination & sulpho chlorination can be performed in it.

PERMISSIBLE OPERATING TEMPERATURE

All Glass components and complete plant can be operated safely at temperature 200° C provided that there is no sudden temperature shock.

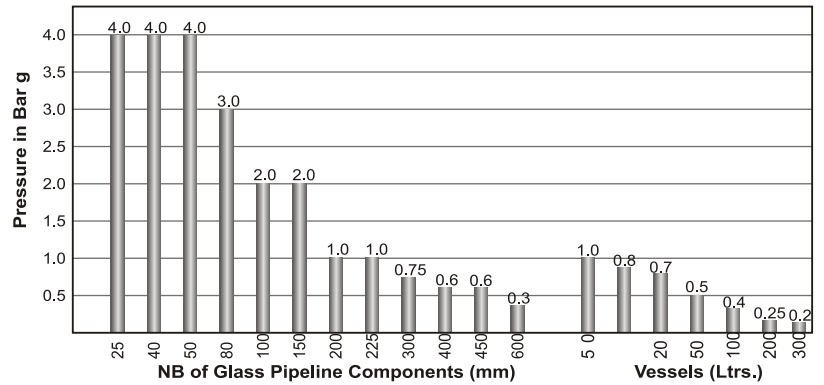
This practical working temperature limit is set by the physical properties of the sideline equipments like gaskets, PTFE bellows, couplings and structure & supports, but not the glass components.

THERMAL SHOCK

Quick changes in temperature across the walls of glass components should be avoided during operation both indoors and outside. They result in increased thermal stress in the glass, which as described above, has an adverse effect on the permissible operating pressure of the plant components. Although it is not possible to give a definite figure applicable to all the operating conditions likely to be encountered in practice, a maximum permissible thermal shock of 120 K can be taken as a general guide.

PERMISSIBLE OPERATING PRESSURE

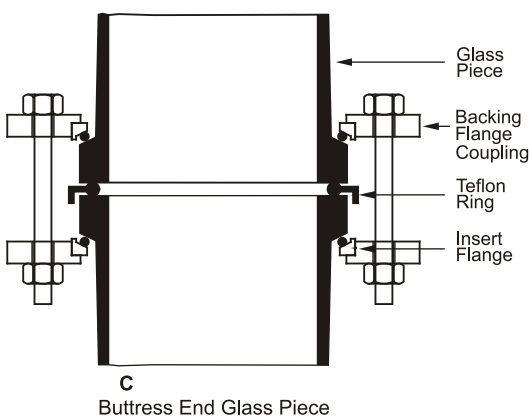
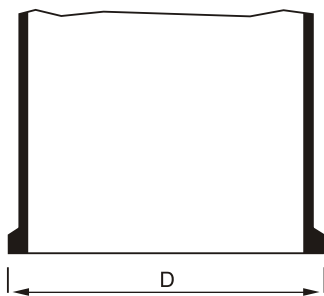
The permissible internal operating working pressure depends on the nominal diameter size of glass components and external temperature. The maximum working pressure for a complete glass plant is determined by the lowest rated components in the system. All glass components are suitable at full vacuum over the entire temperature range. Bar g is a measure of absolute pressure.



GLASS BUTTRESS END

The glass process plant and pipeline components detailed in this catalogue have standard Flat buttress end as per our standard, which are inter-changeable with any international standard. We can also supply Ball & socket (Spherical end forms), and tapered type buttress end as per international standard on request.

The major dimensions of the safety flat buttress ends can be found in the table below, in conjunction with the illustrations alongside.



Nominal bore DN mm	Buttress end diameter D mm	Tolerances (±)
25	42.5	(+) 0.0, (-) 1.5
40	57.5	(+) 0.0, (-) 1.5
50	70	(+) 0.0, (-) 1.5
80	99.5	(+) 0.0, (-) 1.5
100	133	(+) 0.0, (-) 2.0
150	185	(+) 0.0, (-) 2.0
200	232	(+) 0.0, (-) 2.0
225	259	(+) 0.0, (-) 2.0
300	340	(+) 1.0, (-) 3.0
400	464	(+) 1.0, (-) 4.0
450	525	(+) 1.0, (-) 4.0
600	684	(+) 2.0, (-) 6.0

FLANGE DIMENSIONS BALL SOCKET

(as per International Standard)

DN	d2 mm	dm	R mm
15	30	23	18
25	44	34	25
40	62	51	40
50	76	63	50
80	110	96	80
100	130	116	100
150	184	169	150
200	233	220	200
300	338	321	300
400	465	435	-
450	526	492	-
600	684	646	-

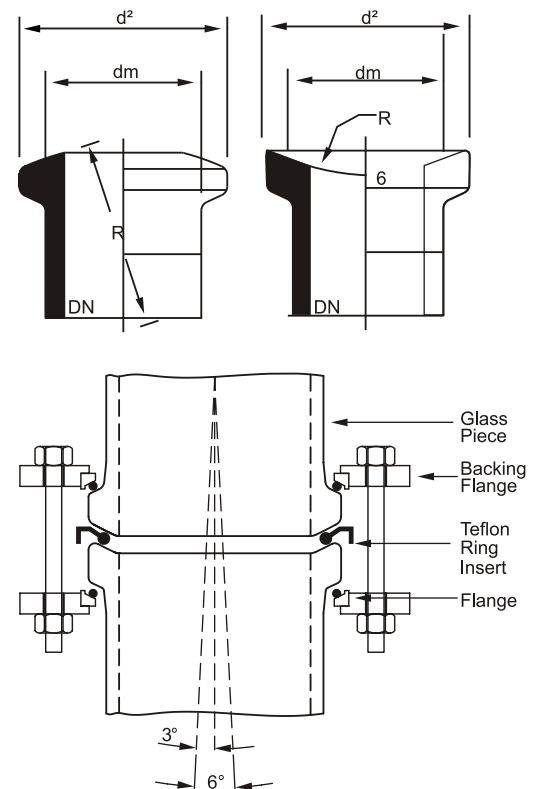
REPAIRS

Though any damaged glass equipment can be repaired, mostly it is not economical to do so. Generally the repair, which involves less than a third of its original work, is worth to carry out repairing. Repair work is costly because:

- It generally requires greater skill than making a new one
- Since it involves high risk of total breakage, the risk of total loss of time spent on its repairing goes along with.
- The work involved in receiving a damaged equipment, identifying it throughout the handling, cleaning it, estimating its repairing charges, re-estimating the repairing charges in case damage extends etc are relatively expensive.
- Each job requires individual attention throughout the execution.

However, while sending equipment for repairing, following care must be taken:

- Inform the nature of breakage and get an estimate of repairing charges in advance to avoid the loss of transportation expenses in case it is uneconomical to go for repairing.
- Since repairing takes longer time to fit into production schedules and completion of repairing is highly uncertain, it is generally suggested to arrange for a substitute equipment to continue the work.
- Equipment to be repaired should be clean. Since it can be cleaned better and at less cost at owner's premises. It should be cleaned before sending it for transportation. This also makes it safer to transport.
- Pack with extra care, since cracks in glass have a tendency to extend with every jerk.
- If Possible, send broken pieces along with it.
- Generally repairing work is accepted only for the equipment manufactured by us, and is repaired at owner's risk only.



**Coupling with standard Ball-Socket end glass piece
Articulation is possible to a maximum of 3°, depending on the diameter**

LENGTH & TOLERANCE OF GLASS COMPONENTS

Tolerance in length L together with dimension L1, L2 and L3 of all components are as under. Unless otherwise should be specified for given components in this catalogue. All dimensions are in mm in this catalogue, unless otherwise specified.

Nominal Bore DN	Length (L, L1, L2, L3)
DN 15 to 40	±3 mm
DN 50 to DN 225	±3.5 mm
DN 300 to DN 450	±4.0 mm
DN 600 _____	±5.0mm

STANDARDS PRACTICED

DIN ISO 3585, DIN ISO 3586, DIN ISO 3587, DIN ISO 4704, BSEN 1595, DIN ISO 718

TROUBLE SHOOTER FOR GLASS USERS

Key to successful growth oriented business relations between Glass Users & Suppliers. Adopt following Instructions and feel free of stations regarding Glass Plants/Units.

Leakage of Glass Plants / Units

During installation / erection of glass plants / units at your site, provide your one person for required training of tightening assembled glass components in case of any minor leakage in future.

Keep replacing PTFE "O" Rings and Couplings as & when required.

In case of heavy leakage please call us immediately.

End of suppliers Responsibility

On installation of glass plants/units & after successful water & vacuum testing the plant/unit, handed over to the buyer. The suppliers cut-off time starts & all responsibilities ends here.

Technical Services

The following technical staff is available on per day charge basis :

(1) Engineer (2) Skilled Fitter (3) Semi Skilled Fitter (4) Helper

TAKE PRECAUTIONS WHILE PLACING YOUR ORDER

Order Confirmation

Place your Order in written form only & ask for written confirmation.

Delivery Schedule

Glass Components are custom made fabricated Items, to attain quality, reasonable specific time is required for making & anneal. Hence plan your requirements well in advance & place order accordingly.

Transportation

Glass is fragile, breaking risk persists during transit & in-case of any damage, disputes /dissatisfaction starts because offered rates were ex-works. To avoid, pick-up any one facility details as under :-

- (1) Transit Insurance, (cost to be charged in Invoice) for transportation of glass components on behalf of buyer & freight on To-pay basis. In case of damage, the buyer is liable to pay Invoiced amount as per terms & conditions to supplier and should get the claim from Insurance company.
- (2) Personal delivery facility against lum-sum charges (called as delivery charges) inclusive of freight charges, risk charges & as well delivery boy expenses.

Packing & Forwarding

Proper & safe packing is essential for safety & P&F Charges extra.

Erection / Dismantling

Erection or dismantling, requires skilled Fitter with professional approach & high risk factor (damage to glass), attracts 7 to 10 % as Erection charges depending upon the nature of Job.



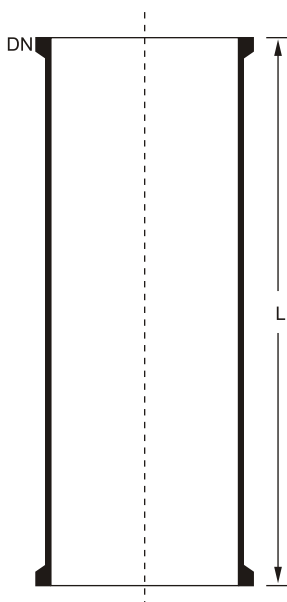
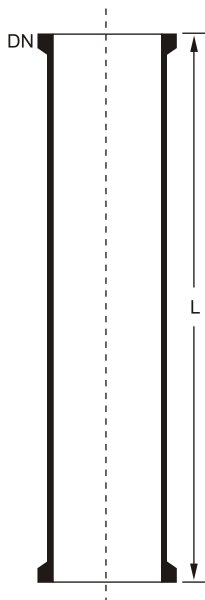
PIPELINE COMPONENTS

Borosilicate glass pipeline components found universal used in the chemical, pharmaceutical and allied industries together with other applications e.g. food and drink production because of its following individuality.

- With almost universal resistance to corrosion, a long service is guaranteed and maintenance is kept to minimize.
- Their transparency permits visual monitoring of the process at all times.
- Being inert, the risk of contamination is negligible.
- Smooth surfaces allow easy cleaning and sterilization and prevent the build-up of solids on the inner wall.

PIPE SECTIONS

DN	L	CAT. REF.
25	75	SPS 1/75
	100	SPS 1/100
	125	SPS 1/125
	150	SPS 1/150
	175	SPS 1/175
	200	SPS 1/200
	300	SPS 1/300
	400	SPS 1/400
	500	SPS 1/500
	700	SPS 1/700
	1000	SPS 1/1000
40	1500	SPS 1/1500
	100	SPS 1.5/100
	125	SPS 1.5/125
	150	SPS 1.5/150
	175	SPS 1.5/175
	200	SPS 1.5/200
	300	SPS 1.5/300
	400	SPS 1.5/400
	500	SPS 1.5/500
	700	SPS 1.5/700
	1000	SPS 1.5/1000
50	1500	SPS 1.5/1500
	100	SPS 2/100
	125	SPS 2/125
	150	SPS 2/150
	175	SPS 2/175
	200	SPS 2/200
	300	SPS 2/300
	400	SPS 2/400
	500	SPS 2/500
	700	SPS 2/700
	1000	SPS 2/1000
80	1500	SPS 2/1500
	125	SPS 3/125
	150	SPS 3/150
	175	SPS 3/175
	200	SPS 3/200
	300	SPS 3/300
	400	SPS 3/400
	500	SPS 3/500
	700	SPS 3/700
	1000	SPS 3/1000
	1500	SPS 3/1500



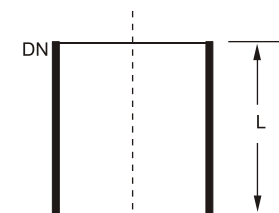
DN	L	CAT. REF.
100	150	SPS 4/150
	175	SPS 4/175
	200	SPS 4/200
	300	SPS 4/300
	400	SPS 4/400
	500	SPS 4/500
	700	SPS 4/700
	1000	SPS 4/1000
	1500	SPS 4/1500
150	150	SPS 6/150
	175	SPS 6/175
	200	SPS 6/200
	300	SPS 6/300
	400	SPS 6/400
	500	SPS 6/500
	700	SPS 6/700
	1000	SPS 6/1000
	1500	SPS 6/1500
225	300	SPS 9/300
	500	SPS 9/500
	1000	SPS 9/1000
	1500	SPS 9/1500
300	300	SPS 12/300
	500	SPS 12/500
	1000	SPS 12/1000
	1500	SPS 12/1500
450	500	SPS 18/500
	1000	SPS 18/1000
	1500	SPS 18/1500
600	500	SPS 24/500
	1000	SPS 24/1000
	1500	SPS 24/1500

SPACERS

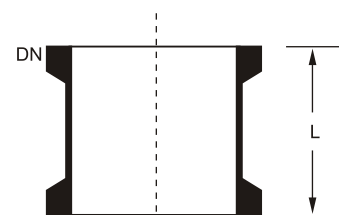
Spacers are used to make up small increments in length and are fitted between standard buttress end components. When incorporating spacers, longer coupling bolts are required together with an additional gasket.

Spacers are available in PTFE too.

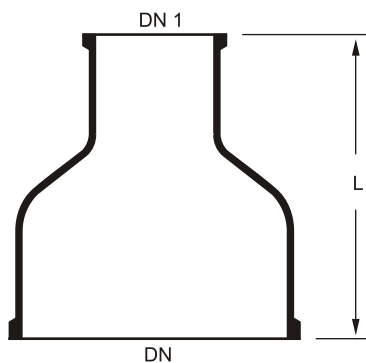
DN	L	CAT. REF.
25	5	SSS 1/5
	15	SSS 1/15
	25	SSS 1/25
	50	SSS 1/50
40	5	SSS 1.5/5
	15	SSS 1.5/15
	25	SSS 1.5/25
	50	SSS 1.5/50
	75	SSS 1.5/75
50	5	SSS 2/5
	15	SSS 2/15
	25	SSS 2/25
	50	SSS 2/50
80	10	SSS 3/10
	20	SSS 3/20
	50	SSS 3/50
	75	SSS 3/75
	100	SSS 3/100



TYPE-A



TYPE-B

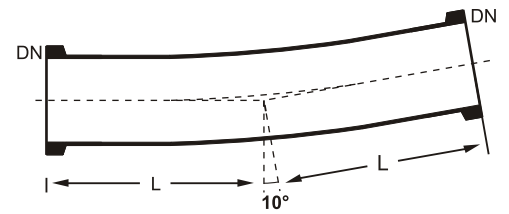


CONCENTRIC REDUCERS

DN	DN1	L	CAT REF.
40	25	100	SPR 1.5/1
50	25	100	SPR 2/1
	40	100	SPR 2/1.5
80	25	125	SPR 3/1
	40	125	SPR 3/1.5
	50	125	SPR 3/2
100	25	150	SPR 4/1
	40	150	SPR 4/1.5
	50	150	SPR 4/2
	80	150	SPR 4/3
150	25	200	SPR 6/1
	40	200	SPR 6/1.5
	50	200	SPR 6/2
	80	200	SPR 6/3
	100	200	SPR 6/4
225	25	250	SPR 9/1
	40	250	SPR 9/1.5
	50	250	SPR 9/2
	80	250	SPR 9/3
	100	250	SPR 9/4
	150	250	SPR 9/6
300	25	275	SPR 12/1
	40	275	SPR 12/1.5
	50	275	SPR 12/2
	80	275	SPR 12/3
	100	275	SPR 12/4
	150	275	SPR 12/6
	225	275	SPR 12/9
400	25	350	SPR 16/1
	40	350	SPR 16/1.5
	50	350	SPR 16/2
	80	350	SPR 16/3
	100	350	SPR 16/4
	150	350	SPR 16/6
	225	350	SPR 16/9
	300	350	SPR 16/12
450	25	325	SPR 18/1
	40	350	SPR 18/1.5
	50	375	SPR 18/2
	80	375	SPR 18/3
	100	375	SPR 18/4
	150	375	SPR 18/6
	225	375	SPR 18/9
	300	375	SPR 18/12
	600	50	350
100		400	SPR 24/4
150		400	SPR 24/6
225		425	SPR 24/9
300		425	SPR 24/12
450		475	SPR 24/18

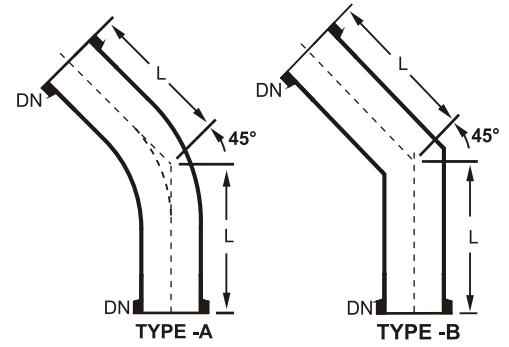
10° BENDS

DN	L	CAT. REF.
25	50	SPB 1/10°
40	75	SPB 1.5/10°



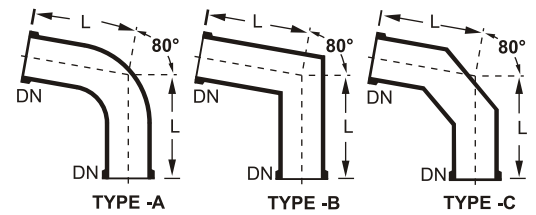
45° BENDS

DN	L	TYPE	CAT. REF.
25	75	A	SPB 1/45°
40	100	A	SPB 1.5/45°
50	100	A	SPB 2/45°
80	125	B	SPB 3/45°
100	175	B	SPB 4/45°
150	200	B	SPB 6/45°
225	225	B	SPB 9/45°
300	275	B	SPB 12/45°



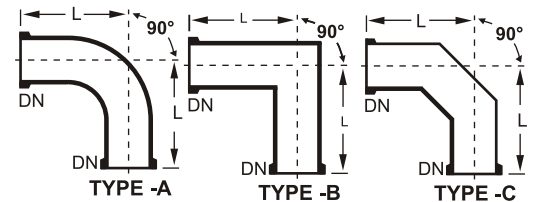
80° BENDS

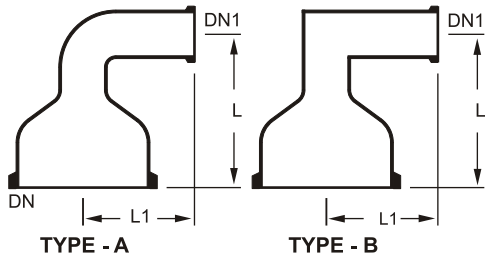
DN	L	TYPE	CAT. REF.
25	100	A	SPB 1/80°
40	150	A	SPB 1.5/80°
50	150	A	SPB 2/80°
80	200	B/C	SPB 3/80°
100	250	B/C	SPB 4/80°
150	250	B/C	SPB 6/80°
225	375	B/C	SPB 9/80°
300	450	B/C	SPB 12/80°



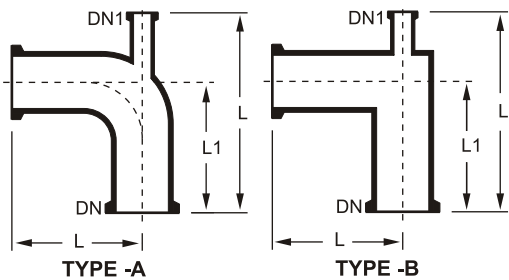
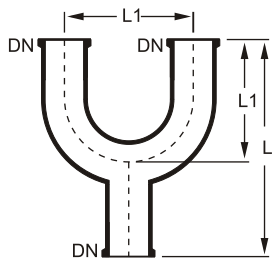
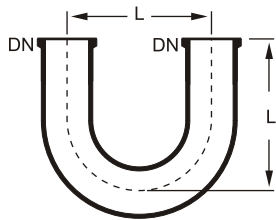
90° BENDS

DN	L	TYPE	CAT. REF.
25	100	A	SPB 1/90°
40	150	A	SPB 1.5/90°
50	150	A	SPB 2/90°
80	200	B/C	SPB 3/90°
100	250	B/C	SPB 4/90°
150	250	B/C	SPB 6/90°
225	375	B/C	SPB 9/90°
300	450	B/C	SPB 12/90°
450	600	B/C	SPB 18/90°





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



90° BENDS REDUCERS

DN	DN1	L	L1	TYPE	CAT. REF.
40	25	150	125	A	SPBR 1.5/1
50	40	150	150	A	SPBR 2/1.5
80	50	150	150	A	SPBR 3/2
100	50	200	150	B	SPBR 4/2
100	80	200	175	B	SPBR 4/3
150	50	200	150	B	SPBR 6/2
150	80	250	175	B	SPBR 6/3
225	80	250	175	B	SPBR 9/3
300	80	300	175	B	SPBR 12/3
300	150	450	250	B	SPBR 12/6
450	150	450	250	B	SPBR 18/6

U BENDS

DN	L	CAT. REF.
25	140	SPU 1
40	180	SPU 1.5
50	180	SPU 2
80	230	SPU 3

U BENDS WITH BOTTOM OUTLET

DN	L	L1	CAT. REF.
25	210	140	SPUO 1
40	270	180	SPUO 1.5
50	280	180	SPUO 2
40/25	270	180	SPUO 1.5/1
50/25	280	180	SPUO 2/1

90° BENDS WITH THERMOMETER BRANCH

DN	DN1	L	L1	TYPE	CAT. REF.
40	25	225	150	A	SPBT 1.5
50	25	225	150	A	SPBT 2
80	25	280	200	A	SPBT 3
100	25	330	250	B	SPBT 4
150	25	340	250	B	SPBT 6
225	25	480	375	B	SPBT 9
300	25	550	450	B	SPBT 12

Y - PIECES

DN	L	L1	L2	CAT. REF.
25	200	75	150	SPY1
40	250	100	175	SPY1.5
50	300	125	200	SPY2
80	350	150	250	SPY3
100	450	150	350	SPY4

CLOSURES

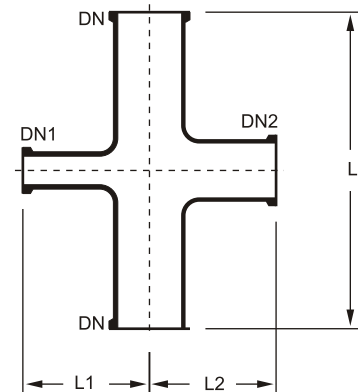
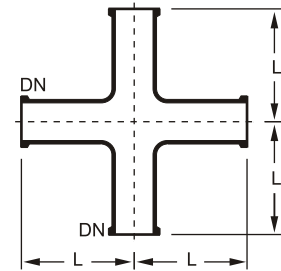
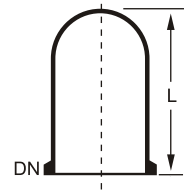
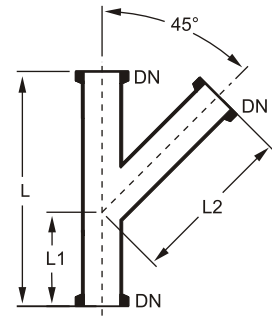
DN	L	CAT. REF.
25	40	SPBE 1
40	50	SPBE 1.5
50	65	SPBE 2
80	75	SPBE 3
100	100	SPBE 4
150	125	SPBE 6
225	125	SPBE 9
300	150	SPBE 12

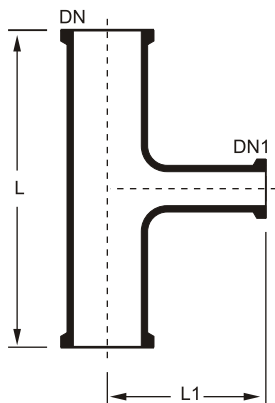
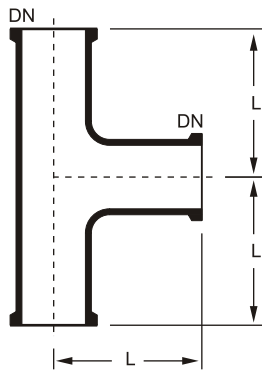
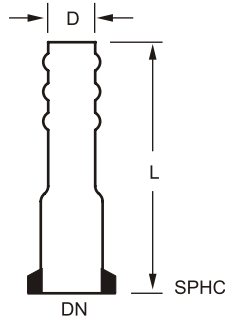
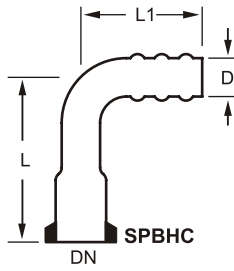
EQUAL CROSSES

DN	L	CAT. REF.
25	100	SPX 1
40	150	SPX 1.5
50	150	SPX 2
80	200	SPX 3
100	250	SPX 4
150	250	SPX 6

UNEQUAL CROSSES

DN	DN1	DN2	L	L1	L2	CAT. REF.
50	25	25	200	80	80	SPXU 2/1/1
	40	25	200	80	100	SPXU 2/1.5/1
80	25	25	250	100	100	SPXU 3/1/1
	40	25	250	100	100	SPXU 3/1.5/1
	50	25	250	100	115	SPXU 3/2/1
100	25	25	250	110	110	SPXU 4/1/1
	40	25	250	110	125	SPXU 4/1.5/1
	50	25	250	110	125	SPXU 4/2/1
	80	25	300	150	150	SPXU 4/3/1
150	40	25	250	150	150	SPXU 6/1.5/1
	50	25	250	150	150	SPXU 6/2/1
	80	50	300	150	175	SPXU 6/3/2
	100	50	300	150	200	SPXU 6/4/2
225	40	40	300	185	185	SPXU 9/1.5/1.5
	50	40	300	185	185	SPXU 9/2/1.5
	80	40	300	185	210	SPXU 9/3/1.5
	100	50	450	185	250	SPXU 9/4/2
	150	80	450	210	275	SPXU 9/6/3
300	50	40	400	230	230	SPXU 12/2/1.5
	80	40	400	230	275	SPXU 12/3/1.5
	100	40	400	230	275	SPXU 12/4/1.5
	150	50	450	230	300	SPXU 12/6/2
	225	80	600	275	300	SPXU 12/9/3





HOSE CONNECTORS

DN	D	L	L1	CAT. REF.
25	12	80	60	SPBHC 1/0.5
25	15	80	60	SPBHC 1/0.5
25	19	80	60	SPBHC 1/0.75
25	26	100	75	SPBHC 1/1
40	26	100	75	SPBHC 1.5/1

DN	D	L	CAT. REF.
25	12	90	SPHC 1/0.5
25	15	90	SPHC 1/0.5
25	19	90	SPHC 1/0.75
25	26	100	SPHC 1/1
40	26	100	SPHC 1.5/1

*D is the bore of the matching hose.

EQUAL TEE

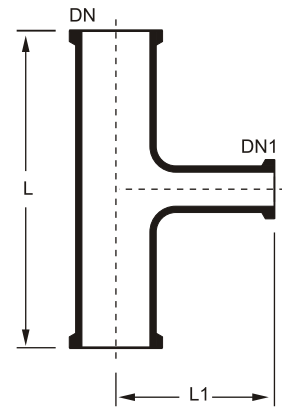
DN	L	CAT. REF.
25	100	SPT 1
40	150	SPT 1.5
50	150	SPT 2
80	200	SPT 3
100	250	SPT 4
150	250	SPT 6
225	375	SPT 9
300	450	SPT 12

UNEQUAL TEE

DN	DN1	L	L1	CAT. REF.
40	25	200	75	SPTU 1.5/1
50	25	200	80	SPTU 2/1
	40	200	100	SPTU 2/1.5
80	25	250	100	SPTU 3/1
	40	250	115	SPTU 3/1.5
	50	250	115	SPTU 3/2
100	25	250	110	SPTU 4/1
	40	250	125	SPTU 4/1.5
	50	250	125	SPTU 4/2
	80	300	150	SPTU 4/3
150	25	250	150	SPTU 6/1
	40	250	150	SPTU 6/1.5
	50	250	150	SPTU 6/2
	80	300	175	SPTU 6/3
	100	300	200	SPTU 6/4

Contd..

225	25	300	185	SPTU 9/1
	40	300	185	SPTU 9/1.5
	50	300	190	SPTU 9/2
	80	300	210	SPTU 9/3
	100	450	250	SPTU 9/4
300	25	400	230	SPTU 12/1
	40	400	230	SPTU 12/1.5
	50	400	230	SPTU 12/2
	80	400	275	SPTU 12/3
	100	400	275	SPTU 12/4
	150	450	300	SPTU 12/6
	225	600	300	SPTU 12/9
400	40	400	275	SPTU 16/1.5
	50	400	275	SPTU 16/2
	80	400	300	SPTU 16/3
	100	400	300	SPTU 16/4
	150	500	350	SPTU 16/6
	225	800	450	SPTU 16/9
	300	800	450	SPTU 16/12
	450	40	400	300
50		400	300	SPTU 18/2
80		400	320	SPTU 18/3
100		400	320	SPTU 18/4
150		600	380	SPTU 18/6
225		800	400	SPTU 18/9
300		800	400	SPTU 18/12
600	100	600	450	SPTU 24/4
	150	600	450	SPTU 24/6
	225	800	525	SPTU 24/9
	300	800	525	SPTU 24/12





SIGHT FLOW INDICATOR (SIGHT GLASS)

Sight Flow Indicator is used for viewing the fluid in pipelines. The sight flow indicator consists of a straight heavy wall glass tube. It offers virtually no flow restrictions, complete visibility & negligible pressure drop. Available with flange connection, in sizes 25 DN to 150 DN.

A sight flow indicator basically consists of a small housing equipped with a glass window, which is inserted in a run of pipe to observe the flow of the fluid in the pipe.

Sight Flow Indicators are available with special materials to meet various applications. Optional materials are available for the housings or flanges.

Salient Features :

- All contact parts are made of Borosilicate Glass & PTFE.
- Standard Flange Drilling as per ANS116.5, ASA 150#. Other drilling Standard as per BS 10 Table D, E, and F is also available upon request.
- Standard length of glass is 152 mm. Other length is available on request. Face to Face length of Sight Glass is 192mm.
- Standard Material of construction of Housing Frame, Flanges & Studs is M.S Zinc plated. S.S 316, S.S.304 & P.P. can be supplied on request.
- Suitable up to 200°C Temperature.

MS FRAME SIGHT GLASS

DN	L	L1	CAT. REF. TABLE E	CAT. REF. TABLE F	CAT. REF. TABLE ASA
25	192	150	SSG1/E	SSG 1/F	SSG 1/A
40	192	150	SSG1.5/E	SSG 1.5/F	SSG 1.5/A
50	192	150	SSG2/E	SSG 2/F	SSG 2/A
80	192	150	SSG3/E	SSG 3/F	SSG 3/A
100	192	150	SSG4/E	SSG 4/F	SSG 4/A
150	192	150	SSG6/E	SSG 6/F	SSG 6/A

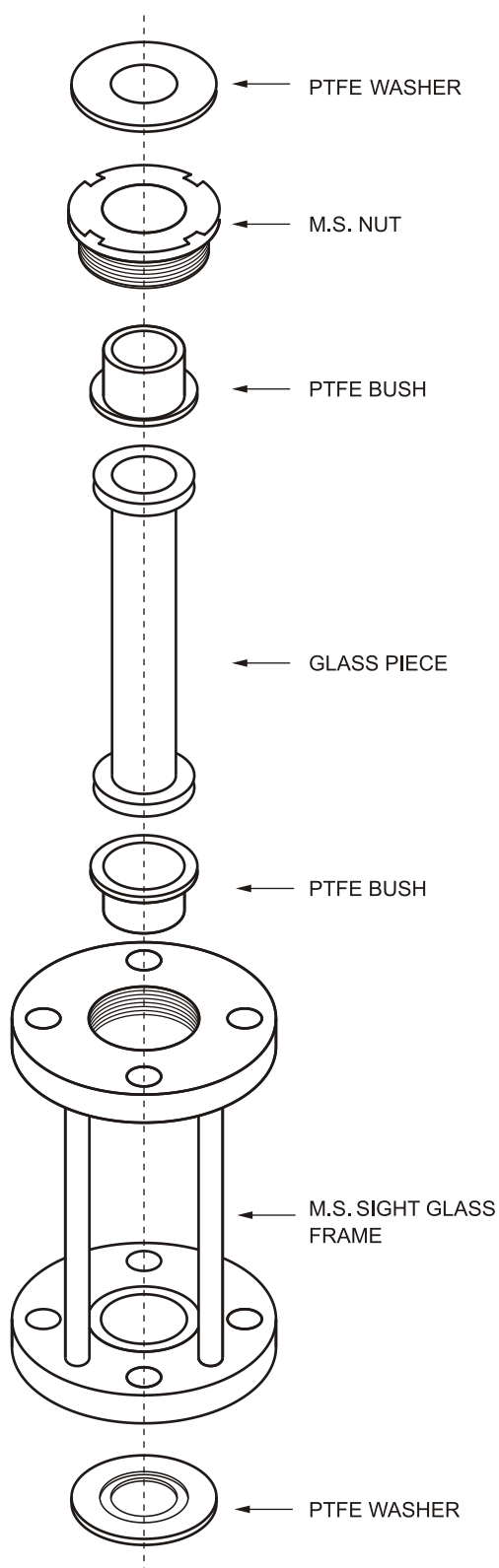
SS304 FRAME SIGHT GLASS

DN	L	L1	CAT. REF. TABLE E	CAT. REF. TABLE F	CAT. REF. TABLE ASA
25	192	150	SSG 1/E/304	SSG 1/F/304	SSG1/A/304
40	192	150	SSG1.5/E/304	SSG1.5/F/304	SSG1.5/A/304
50	192	150	SSG2/E/304	SSG2/F/304	SSG2/A/304
80	192	150	SSG3/E/304	SSG3/F/304	SSG3/A/304
100	192	150	SSG4/E/304	SSG4/F/304	SSG4/A/304
150	192	150	SSG6/E/304	SSG6/F/304	SSG6/A/304

SS304 FRAME SIGHT GLASS

DN	L	L1	CAT. REF. TABLE E	CAT. REF. TABLE F	CAT. REF. TABLE ASA
25	192	150	SSG 1/E/316	SSG 1/F/316	SSG1/A/316
40	192	150	SSG1.5/E/316	SSG1.5/F/316	SSG1.5/A/316
50	192	150	SSG2/E/316	SSG2/F/316	SSG2/A/316
80	192	150	SSG3/E/316	SSG3/F/316	SSG3/A/316
100	192	150	SSG4/E/316	SSG4/F/316	SSG4/A/316
150	192	150	SSG6/E/316	SSG6/F/316	SSG6/A/316

For Pressure rating consult our technical team.





VALVES

The valves are essential part of any chemical process plant, pharmaceuticals and allied industries in a wide range of application from relatively simple on/off function to control, pressure relief and filtering.

The valve bodies are of borosilicate glass and PTFE bellows. The PTFE bellows is flanged at one to seal between the valve body and bonnet part, as a result operation of the valve can be checked visually. In practically every case glass is combined with PTFE, which ensures that the valves have maximum resistance to corrosion. All the valves in the range are suitable to use under full vacuum.

LINE VALVES

DN	DN1	L	CAT. REF.
25	25	175	SPV 1
40	40	225	SPV 1.5
40	25	200	SPV 1.5/1
50	50	300	SPV 2
80	80	375	SPV 3

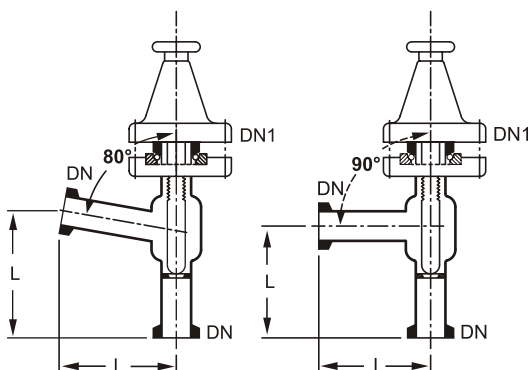
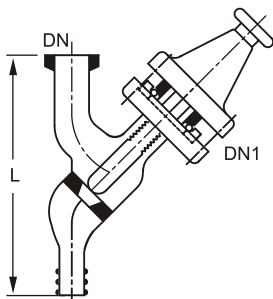
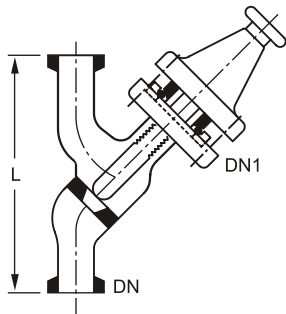
DRAIN VALVES

DN	DN1	L	CAT. REF.
25	25	175	SPVD1
40	25	200	SPVD1.5/1
40	40	225	SPVD1.5
50	50	300	SPVD2

ANGLE VALVES

DN	DN1	L	CAT. REF.
25	25	100	SPVE 1
40	40	150	SPVE 1.5
50	50	150	SPVE 2
80	80	200	SPVE 3

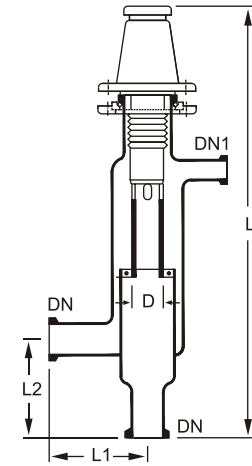
Angle valve can be provided in Both 90° & 80°.



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 given limits to set the required overflow level.

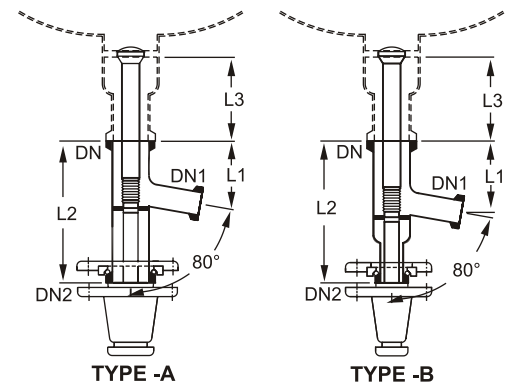
DN	DN1	D	L	L1	L2	I/HR.	CAT. REF.
25	25	25	420	100	50	600	SOF1
40	25	25	600	150	90	900	SOF1.5
50	25	35	600	150	90	1600	SOF2



BOTTOM OUTLET VALVES

These valves prevent the accumulation of solids or liquid in the bottom outlet of a vessel. This valve can be incorporated in any spherical or cylindrical vessel.

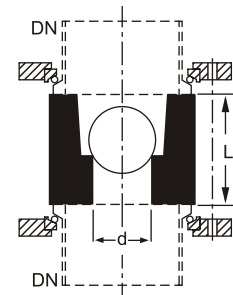
DN	DN1	DN2	L1	L2	L3	TYPE	CAT. REF.
40	25	40	70	115	120	A	SBAL 1.5
50	25	40	90	140	150		SBAL 2
40	25	25	90	150	160	B	SBAL 1.5
50	40	25	90	175	175		SBAL 2



NON-RETURN VALVES BALL TYPE

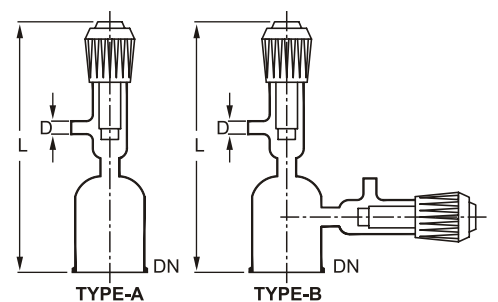
These valves are used in vertical lines only. They are clamped between buttress end using long bolts. The complete assembly comprises the glass body and the PTFE retaining plate.

DN	D	L	CAT. REF.
25	10	25	SNRD 1
40	15	33	SNRD 1.5
50	20	41	SNRD 2
80	25	65	SNRD 3



VENT VALVES

DN	D	L	CAT. REF.
25	12	145	SVST 1
40	12	150	SVST 1.5

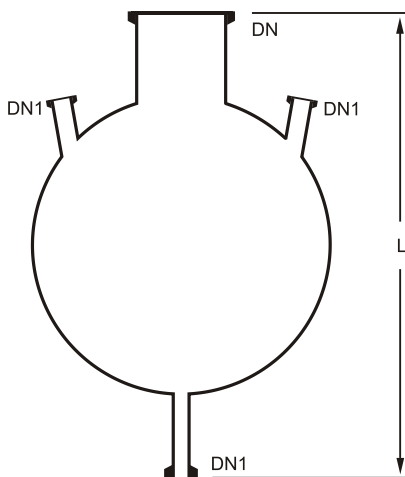
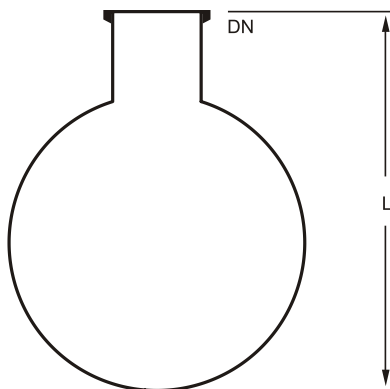
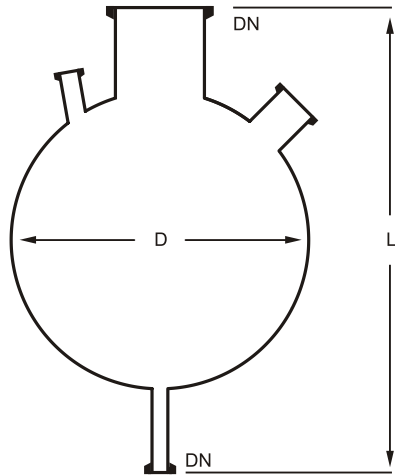




VESSELS & STIRRERS

Vessels are used as reactors, receivers, separators, measuring, feeds etc. Vessels can be used under full vacuum and as per given below working pressure (Bar g).

Vessels are available in spherical / cylindrical shape from 5Ltr. to 300Ltr. capacity. Vessels are provided with a bottom outlet nozzle, for which a suitable valve can be chosen from range of valves.



SPHERICAL VESSELS GENERAL DATA

NOMINAL CAP. (LTR.)	BULB DIAMETER MM D	MAXIMUM INTERNAL PRESSURE (Bar g)	TOLERANCE OF DIAMETER MM	TOLERANCE IN LENGTH MM L
5	220	1.0	± 2	± 5
10	285	0.8	± 2	± 5
20	350	0.7	± 2	± 5
50	470	0.5	± 3	± 5
100	600	0.4	± 4	± 5
200	750	0.25	± 5	± 8
300	850	0.20	± 6	± 8

500 liter Vessel on request.

SINGLE NECK SPHERICAL VESSELS

NOMINAL CAP. (LTR.)	DN MM	L MM	CAT REF.
5 L	40	270	SVSA 5
10 L	40	350	SVSA 10
20 L	80	430	SVSA 20
50 L	100	590	SVSA 50
100 L	150	740	SVSA 100
200 L	225	910	SVSA 200
300 L	300	1025	SVSA 300

Tolerance ± as per given general data in vessel chapter.

THREE NECK BOTTOM OUTLET SPHERICAL VESSELS

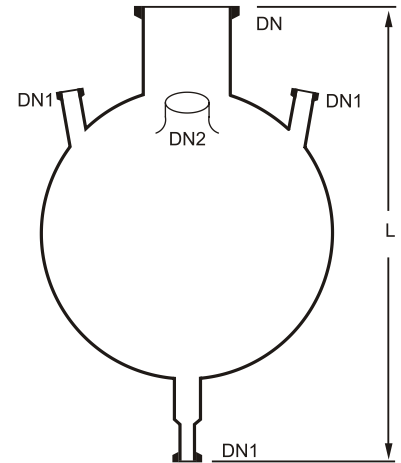
NOMINAL CAP. (LTR.)	DN	DN1	L	CAT REF.
5 L	40	25	345	SVSM 5
10 L	40	25	425	SVSM 10
20 L	80	25	525	SVSM 20
50 L	100	40	690	SVSM 50
100 L	150	40	840	SVSM 100
200 L	225	40	1020	SVSM 200
300 L	300	40	1155	SVSM 300

Tolerance ± as per given general data in vessel chapter.

FOUR NECK BOTTOM OUTLET SPHERICAL VESSELS

NOMINAL CAP. (LTR.)	DN	DN1	DN2	L	CAT. REF.
5 L	50	25	40	445	SVSPL 5
10 L	50	25	40	525	SVSPL 10
20 L	80	25	40	605	SVSPL 20
50 L	100	40	100	765	SVSPL 50
100 L	150	40	100	920	SVSPL 100
200 L	225	40	100	1100	SVSPL 200
300 L	300	40	100	1215	SVSPL 300

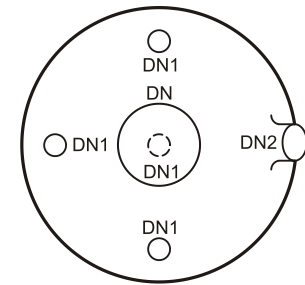
Tolerance \pm as per given general data in vessel chapter.



FIVE NECK BOTTOM OUTLET SPHERICAL VESSELS

NOMINAL CAP. (LTR.)	DN	DN1	DN2	L	CAT. REF.
5 L	50	25	40	445	SVSL5
10 L	50	25	40	525	SVSL10
20 L	80	25	40	605	SVSL20
50 L	100	40	100	765	SVSL50
100 L	150	40	100	920	SVSL100
200 L	225	40	100	1100	SVSL200
300 L	300	40	100	1215	SVSL300

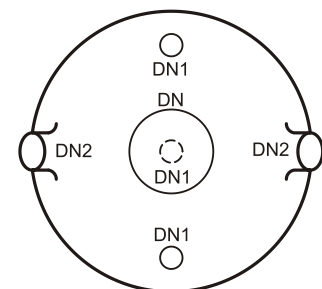
Tolerance \pm as per given general data in vessel chapter.



FIVE NECK BOTTOM OUTLET SPHERICAL VESSELS

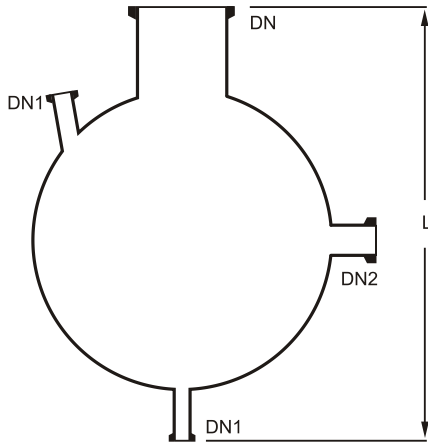
NOMINAL CAP. (LTR.)	DN	DN1	DN2	L	CAT. REF.
5 L	50	25	40	445	SVS 5
10 L	50	25	40	525	SVS 10
20 L	80	25	40	605	SVS 20
50 L	100	40	100	765	SVS 50
100 L	150	40	100	920	SVS 100
200 L	225	40	100	1100	SVS 200
300 L	300	40	100	1215	SVS 300

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 .

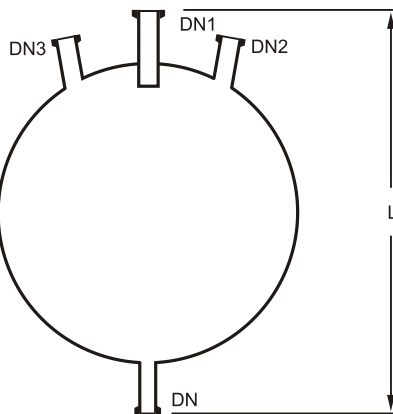


NOMINAL CAP. (LTR.)	DN	DN1	DN2	L	CAT. REF.
5 L	40	25	25	345	SVSD 5
10 L	40	25	40	425	SVSD 10
20 L	80	25	40	525	SVSD 20
50 L	100	40	80	690	SVSD 50
100 L	150	40	80	840	SVSD 100
200 L	225	40	80	1020	SVSD 200
300 L	300	40	80	1155	SVSD 300

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

RECEIVERS SPHERICAL VESSELS

Receivers are provided with built-in drip pipe.

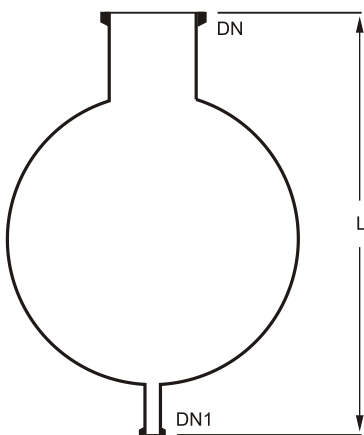


NOMINAL CAP. (LTR.)	DN	DN1	DN2 10 DEG.	DN3 10 DEG.	L	CAT. REF.
5 L	25	25	25	-	345	SVR 5
10 L	25	25	25	-	425	SVR 10
20 L	25	25	25	-	525	SVR 20
5 L	25	25	25	25	345	SVRB 5
10 L	25	25	25	25	425	SVRB 10
20 L	25	25	25	25	525	SVRB 20

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

ADDITION SPHERICAL VESSELS

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



NOMINAL CAP. (LTR.)	DN	DN1	L	CAT REF.
5 L	40	25	345	SVA 5
10 L	40	25	425	SVA 10
20 L	80	25	525	SVA 20
50 L	100	40	690	SVA 50
100 L	150	40	840	SVA 100
200 L	225	40	1020	SVA 200
300 L	300	40	1155	SVA 300

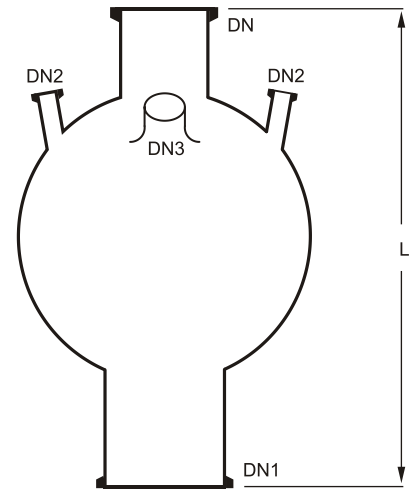
Tolerance \pm as per given general data in vessel chapter.

WIDE BOTTOM OUTLET SPHERICAL VESSELS

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

NOMINAL CAP. (LTR.)	DN	DN1	DN2	DN3	L	CAT REF.
50 L	100	150	40	100	715	SVSR 50
100 L	150	150	40	100	885	SVSR 100
200 L	225	150	40	100	1075	SVSR 200
50 L	100	150	40	100	725	SVSE 50
100 L	150	225	40	100	900	SVSE 100
200 L	225	225	40	100	1100	SVSE 200

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

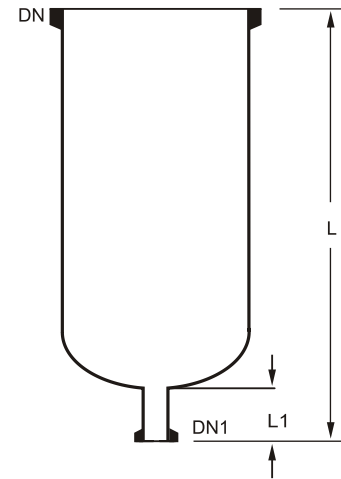


CYLINDRICAL VESSELS

Cylindrical vessels can be used for various purposes e.g. reaction, separating receiver and feeding. 50 liter and above cylindrical vessel need to be supported in a vessel holder.

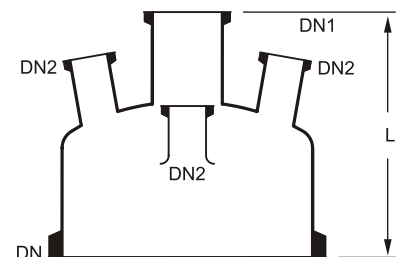
NOMINAL CAP. (LTR.)	DN	DN1	L	L1	CAT REF.
5 L	100	25	700	60	SVZ 5/4
5 L	150	25	460	60	SVZ 5/6
10 L	150	25	720	60	SVZ 10/6
20 L	225	25	750	60	SVZ 20/12
30 L	300	40	635	65	SVZ 30/12
50 L	300	40	915	65	SVZ 50/12
100 L	450	40	890	65	SVZ 100/18
150 L	450	40	1195	65	SVZ 150/18
200 L	450	40	1500	65	SVZ 200/18
300 L	600	40	1320	65	SVZ 300/24
400L	600	40	1650	65	SVZ 400/24

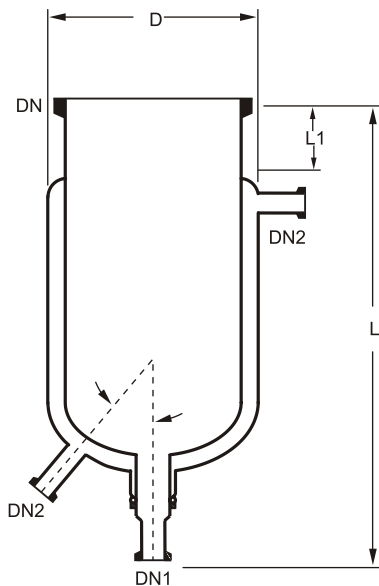
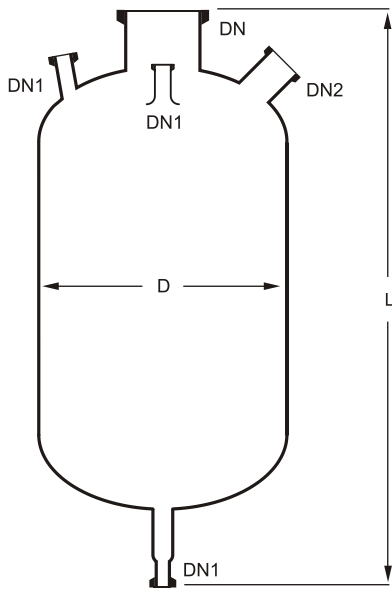
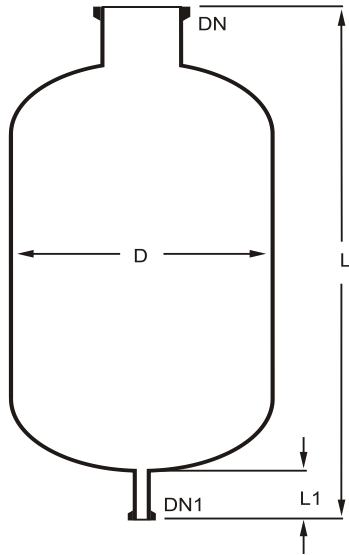
Tolerance \pm as per given general data in vessel chapter.



CYLINDRICAL VESSEL COVERS

NOMINAL CAP. (LTR.)	DN	DN1	DN2	L	CAT. REF.
5 L	150	50	25 x 3	200	SVZA 5/6
10 L	150	50	25 x 3	200	SVZA 10/6
20 L	225	50	25 x 3	240	SVZA 20/12
30 L	300	50	25 x 3	225	SVZA 30/12
50 L	300	50	40 x 3	250	SVZA 50/12
	300	80	40 x 2	250	
100 L	450	50	40 x 2	325	SVZA 100/18
	450	80	40 x 2	325	
	450	100	40 x 2	350	
150 L	450	100	40 x 2	350	SVZA 150/18
200 L	450	100	40 x 2	350	SVZA 200/18
300 L	600	50	40 x 2	375	SVZA 300/24
	600	80	40 x 2	375	
	600	100	40 x 2	400	
400 L	600	100	40 x 2	400	SVZA 400/24





CYLINDRICAL VESSELS RECEIVERS

NOMINAL CAP. (LTR.)	D	DN	DN1	L	L1	CAT REF.
20 L	300	100	25	650	60	SVZR20/12
30 L	300	150	40	800	65	SVZR30/12
50 L	300	150	40	1000	65	SVZR50/12
100 L	450	225	40	1100	65	SVZR100/18
150 L	450	225	40	1400	65	SVZR150/18
200 L	450	225	40	1625	65	SVZR200/18
300 L	600	225	40	1500	75	SVZR 300/24

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

CYLINDRICAL FLASK

NOMINAL CAP. (LTR.)	D	DN	DN1	DN2 45 DEG.	L	CAT REF.
5 L	200	50	25	40	475	SVCY 5
10 L	220	50	25	40	600	SVCY 10
20 L	300	80	25	50	650	SVCY 20
30 L	300	80	25	50	790	SVCY 30
50 L	420	100	40	100	795	SVCY 50
100 L	470	150	40	100	1020	SVCY 100
150 L	470	150	40	100	1315	SVCY 150
200 L	600	225	40	100	1190	SVCY 200
300 L	600	225	40	100	1590	SVCY 300
400 L	650	300	40	100	1715	SVCY 400

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

JACKETED VESSELS

Cylindrical vessels are available with a glass jacket for heating and cooling duties. The material of construction of the jacket, Borosilicate glass, has been taken into design of the jacket seals. The jacket is fused directly to vessel or silicon rubber or viton 'O' Ring is used.

- Glass jacket can be used for a maximum operating pressure of 0.5 barg.
- Maximum operating temperature 130°C in jacket.
- Temperature difference between jacket & vessel should not exceed 120°C.

NOMINAL CAP. LTR.	DN	DN1	DN2	D	L	L1	REF. CAT.
5 L	100	25	25	165	825	150	SVZD 5/4
	150	25	25	220	600	150	SVZD 5/6
10 L	150	25	25	220	850	150	SVZD 10/6
	225	40	25	300	600	175	SVZD 10/9
20 L	225	40	25	300	900	175	SVZD 20/9
	300	40	25	390	650	200	SVZD 20/12
30 L	300	40	25	390	775	200	SVZD 30/12
50 L	300	40	25	390	1050	200	SVZD 50/12
60 L	300	40	25	390	1200	200	SVZD 60/12
100 L	400	40	25	460	1100	210	SVZD 100/16
	450	40	25	515	1000	210	SVZD 100/18

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

VESSEL HOLDERS

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

VESSEL CAPACITY	CAT. REF.
10 L	SVSS 10
20 L	SVSS 20
30 L	SVSS 30
50 L	SVSS 50
100 L	SVSS 100
200 L	SVSS 200
300 L	SVSS 300

VESSEL HOLDER RING

These metal rings are wrapped with asbestos rope and are to be supported with four bolts.

VESSEL CAPACITY	CAT. REF.
5 L	SVSR 5
10 L	SVSR 10
20 L	SVSR 20

DIP PIPES

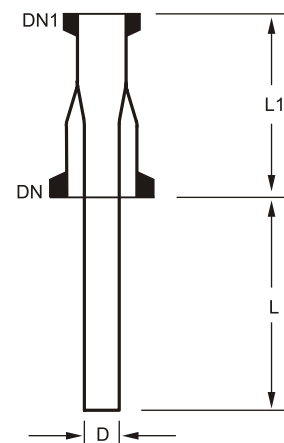
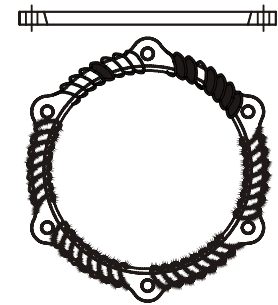
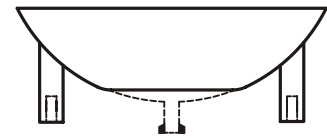
Dip pipes are used to feed material in vessels.

VESSEL CAP. (LTR.)	DN	DN1	D	L	L1	CAT REF.
5 L	25	25	12	150	100	SDP 5
10 L	25	25	12	200	100	SDP 10
20 L	25	25	12	300	100	SDP 20
50 L	40	25	19	380	100	SDP 50
100 L	40	25	19	480	100	SDP 100
200 L	40	25	19	580	100	SDP 200
300 L	40	25	19	680	100	SDP 300

SHORT DIP PIPES

Short dip pipe are used as re-entry tubes for vessels , Heat exchangers etc.

DN	DN1	D	L	L1	CAT. REF.
25	25	12	100	100	SDP 1/1
40	25	19	100	100	SDP 1.5/1
40	40	19	100	100	SDP 1.5/1.5
50	25	25	100	100	SDP 2/1
50	40	25	100	100	SDP 2/1.5
80	40	38	100	125	SDP 3/1.5
100	25	25	100	150	SDP 4/1
100	50	50	100	150	SDP 4/2
150	40	40	100	200	SDP 6/1.5
150	50	50	100	200	SDP 6/2





THERMOMETER POCKETS

Thermometer pockets are used to put thermometer, where temperature need to be measured.

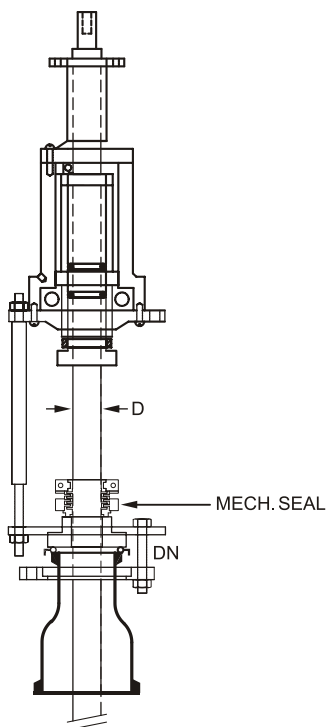
VESSEL CAP. (LTR.)	DN	D	L	L1	CAT REF.
5 L	25	12	150	50	STP 5
10 L	25	12	200	50	STP 10
20 L	25	12	300	50	STP 20
50 L	40	19	380	50	STP 50
100 L	40	19	480	50	STP 100
200 L	40	19	580	50	STP 200
300 L	40	19	680	50	STP 300

STIRRERS

A variety of stirrers and stirrer drives are available to use glass vessel as agitated reaction equipment. Stirrers assemblies are used with spherical or cylindrical vessels generally comprise two main components : a drive unit (including shaft seal) and a stirrer shaft. In addition a reducer or vessels cover is normally required to connect the top neck of the vessel to the drive unit . Variable speed drive units can be supplied on request .

CHUCK & SEAL

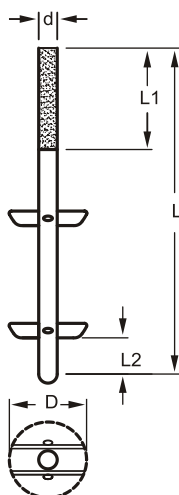
This unit is suitable to use under corrosive conditions. Only GLASS & PTFE are exposed to process fluids. Bellow seal can be used under vacuum down to 10 mm Hg absolute. Mechanical seal can be use under vacuum 1mm Hg absolute or under pressure permitted in to glass vessels.



VESSEL CAP. (LTR.)	DN	D	CAT. REF.	
			BELLOW SEAL	MECH. SEAL
10 L	50	24.5	SCSA1	SCSM 1
20 L	50	24.5	SCSA1	SCSM 1
50 L	50	24.5	SCSA1	SCSM 1
100 L	80	45.5	SCSA1.5	SCSM 1.5
200 L	80	45.5	SCSA1.5	SCSM 1.5
300 L	80	45.5	SCSA1.5	SCSM 1.5

GLASS STIRRER WITH TEFLON BLADE.

These stirrers are used for low viscosity fluid.



VESSEL CAP. (LTR.)	d	D	L	L1	CAT. REF.	
					L2	MECH. SEAL
5L	24.5	40	625	350	25	SSTB 5
10 L	24.5	40	700	350	25	SSTB10
20 L	24.5	70	800	350	25	SSTB20
50 L	24.5	90	1000	350	25	SSTB50
100 L	45.5	140	1200	375	30	SSTB100
200 L	45.5	170	1400	400	30	SSTB200
300 L	45.5	170	1500	400	30	SSTB300

VORTEX STIRRER

These stirrers are used for low viscosity fluid containing small solid particles.

VESSEL CAP. (LTR.)	d	D	L	L1	L2	CAT. REF. MECH. SEAL
5L	24.5	40	625	350	50	SSTV 5
10 L	24.5	40	700	350	50	SSTV 10
20 L	24.5	50	800	350	50	SSTV 20
50 L	24.5	65	1000	350	65	SSTV 50
100 L	45.5	65	1200	375	65	SSTV 100
200 L	45.5	105	1400	400	65	SSTV 200
300 L	45.5	105	1500	400	65	SSTV 300

PROPELLER STIRRER

These stirrers are used for high viscosity fluid or liquid with big solid particles.

VESSEL CAP. (LTR.)	d	D	L	L1	L2	CAT. REF. MECH. SEAL
5L	24.5	40	625	350	50	SSTP5
10 L	24.5	40	700	350	50	SSTP10
20 L	24.5	50	800	350	50	SSTP20
50 L	24.5	65	1000	350	65	SSTP50
100 L	45.5	65	1200	375	65	SSTP100
200 L	45.5	105	1400	400	65	SSTP200
300 L	45.5	105	1500	400	65	SSTP200

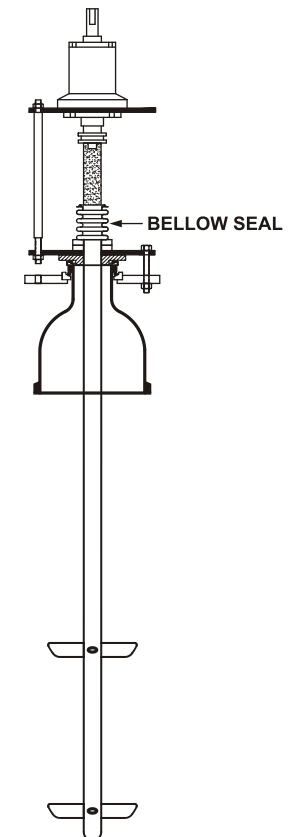
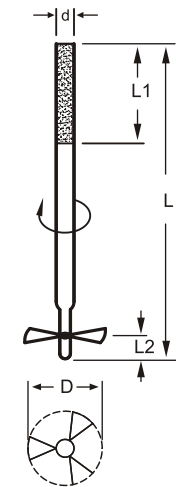
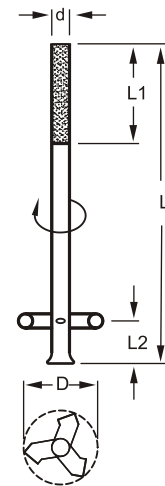
DRIVE ASSEMBLY FOR GLASS STIRRERS WITH BELLOW SEAL

A stirrer is assembled in chuck with bellow seal and appropriate reducer. This assembly is convenient to install on a vessel. These assembly mainly consist of :

- A. Glass Stirrer (SSTB / SSTV / SSTP)
- B. Chuck and seal assembly (SCSA)
- C. Reducer (SPR)

These stirrers are used for high viscosity fluid or liquid with big solid particles.

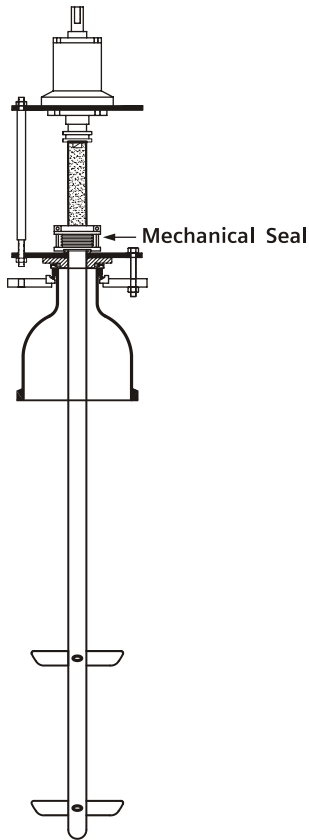
VESSEL CAPACITY	STIRRER USED	CHUCK & SEAL USED	REDUCER USED	CAT. REF.
10 L	SSTB 10	SCSA 1	-	SSTBA 10
20 L	SSTB 20	SCSA 1	SPR 3/2	SSTBA 20
50 L	SSTB 50	SCSA 1	SPR 4/2	SSTBA 50
100 L	SSTB 100	SCSA 1.5	SPR 6/3	SSTBA 100
200 L	SSTB 200	SCSA 1.5	SPR 9/3	SSTBA 200
300 L	SSTB 300	SCSA 1.5	SPR 12/3	SSTBA 300
10 L	SSTV 10	SCSA 1	-	SSTVA 10
20 L	SSTV 20	SCSA 1	SPR 3/2	SSTVA 20
50 L	SSTV 50	SCSA 1	SPR 4/2	SSTVA 50
100 L	SSTV 100	SCSA 1.5	SPR 6/3	SSTVA 100
200 L	SSTV 200	SCSA 1.5	SPR 9/3	SSTVA 200
300 L	SSTV 300	SCSA 1.5	SPR 12/3	SSTVA 300
10 L	SSTP 10	SCSA 1	-	SSTPA 10
20 L	SSTP 20	SCSA 1	SPR 3/2	SSTPA 20
50 L	SSTP 50	SCSA 1	SPR 4/2	SSTPA 50
100 L	SSTP 100	SCSA 1.5	SPR 6/3	SSTPA 100
200 L	SSTP 200	SCSA 1.5	SPR 9/3	SSTPA 200
300 L	SSTP 300	SCSA 1.5	SPR 12/3	SSTPA 300



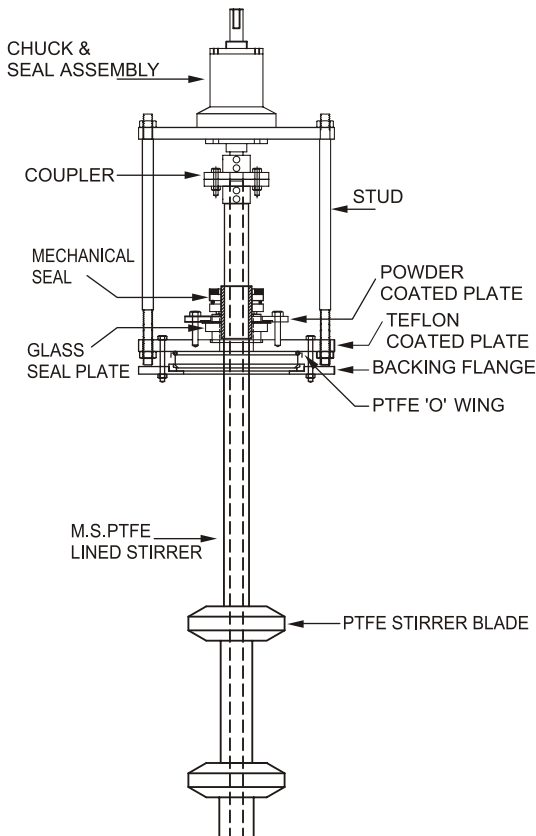
DRIVE ASSEMBLY FOR GLASS STIRRERS WITH MECHANICAL SEAL

A stirrer is assembled in chuck with mechanical seal and appropriate reducer. This assembly is convenient to install on a vessel. These assembly mainly consist of :

- A. Glass Stirrer (SSTB/ SSTV/ SSTP)
- B. Chuck and mechanical seal (SCSM)
- C. Reducer (SPR)



VESSEL CAPACITY	STIRRER USED	CHUCK & SEAL USED	REDUCER USED	CAT. REF.
10 L	SSTB 10	SCSA 1	-	SSTBM10
20 L	SSTB 20	SCSA 1	SPR 3/2	SSTBM20
50 L	SSTB 50	SCSA 1	SPR 4/2	SSTBM50
100 L	SSTB 100	SCSA 1.5	SPR 6/3	SSTBM 100
200 L	SSTB 200	SCSA 1.5	SPR 9/3	SSTBM 200
300 L	SSTB 300	SCSA 1.5	SPR 12/3	SSTBM 300
10 L	SSTV10	SCSA 1	-	SSTVM 10
20 L	SSTV20	SCSA 1	SPR 3/2	SSTVM 20
50 L	SSTV50	SCSA 1	SPR 4/2	SSTVM 50
100 L	SSTV100	SCSA 1.5	SPR 6/3	SSTVM 100
200 L	SSTV200	SCSA 1.5	SPR 9/3	SSTVM 200
300 L	SSTV300	SCSA 1.5	SPR 12/3	SSTVM 300
10 L	SSTP 10	SCSA 1	-	SSTPM 10
20 L	SSTP 20	SCSA 1	SPR 3/2	SSTPM 20
50 L	SSTP 50	SCSA 1	SPR 4/2	SSTPM 50
100 L	SSTP 100	SCSA 1.5	SPR 6/3	SSTPM 100
200 L	SSTP 200	SCSA 1.5	SPR 9/3	SSTPM 200
300 L	SSTP 300	SCSA 1.5	SPR 12/3	SSTPM 300



M.S. PTFE LINED STIRRER

A Stirrer assembled with chuck & mechanical seal. This assembly is convenient to install on a vessel. These assembly mainly consists of :

- a. M.S. PTFE Lined Stirrer
- b. Chuck and Mechanical Seal
- c. Teflon Coated Plate
- d. PTFE Impeller

BATHS

COOLING BATHS

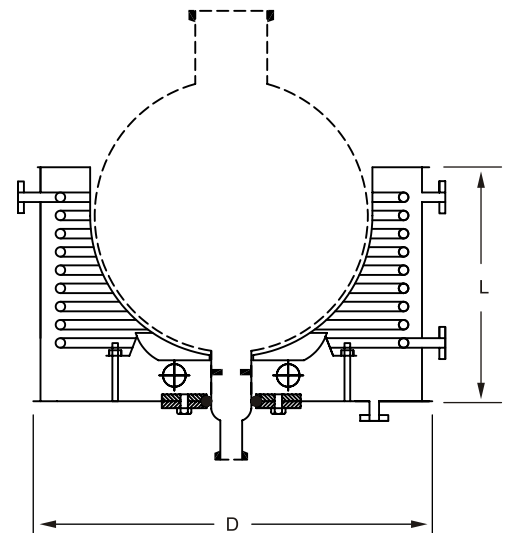
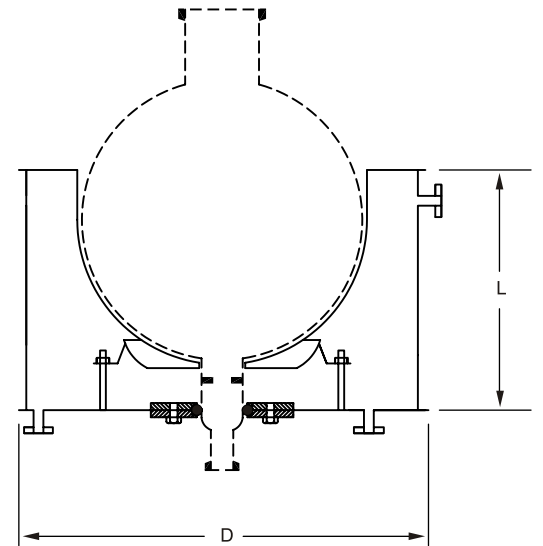
Cooling baths are used for cooling the glass vessel with ice crystals. Cooling baths are provided with a vessel holding ring, bottom outlet sealing arrangement and a lid.

VESSEL CAP. (LTR.)	D	L	CAT. REF.
5 L	325	225	SBHC 5
10 L	350	250	SBHC 10
20 L	480	330	SBHC 20
50 L	615	415	SBHC 50
100 L	720	510	SBHC 100
200 L	900	620	SBHC 200

HEATING BATHS - WITH COIL & HEATER

M.S. Heating baths are used with electrical or steam heating for glass vessel. Depending upon the temperature requirements, different types of thermic fluids or water can be used as heating media. Heating baths are provided with a pair of non flame proof heaters, M.S. Coil for passing the steam or cooling water, cushioned vessel holder, a bottom outlet sealing arrangement, a lid and threaded socket type or flange type inlet and outlets.

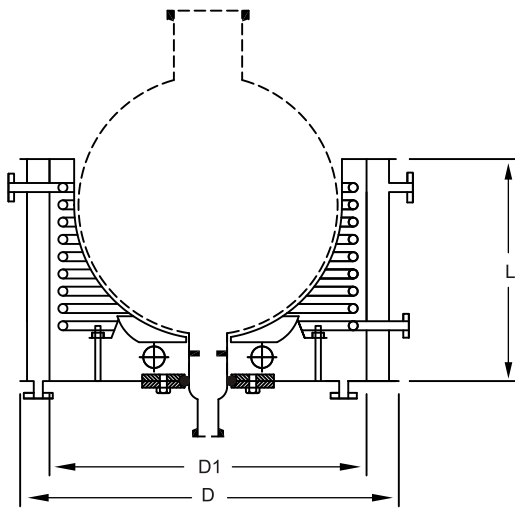
VESSEL CAP. (LTR.)	D	L	LOADING KW	CAT. REF.
5 L	325	225	2 (2x1000)	SBH 5
10 L	350	250	2 (2x1000)	SBH 10
20 L	480	330	3 (3x1000)	SBH 20
50 L	615	415	4.5 (3x1500)	SBH 50
100 L	720	510	6 (3x2000)	SBH 100
200 L	900	620 </td <td>9 (3x3000)</td> <td>SBH 200</td>	9 (3x3000)	SBH 200



HEATING BATHS - JACKETED WITH COIL

MS Jacketed heating bath is provided with a coil inside to circulate either steam or heat transfer fluid depending upon the application. Provision for insertion of Electrical heater is also kept.

(Non-flame proof) Heater can also be provided along with the bath on request. Although the standard heating baths are specifically designed for spherical vessels, similar baths for cylindrical vessels can also be supplied to special order. All these heating baths can be fitted with suitable temperature control equipment if required.



VESSEL				
CAP. (LTR.)	D1	D	L	CAT. REF.
5 L	325	395	260	SBHD5
10 L	350	420	285	SBHD10
20 L	480	550	365	SBHD 20
50 L	635	685	465	SBHD 50
100 L	730	830	560	SBHD 100
200 L	900	1050	680	SBHD 200

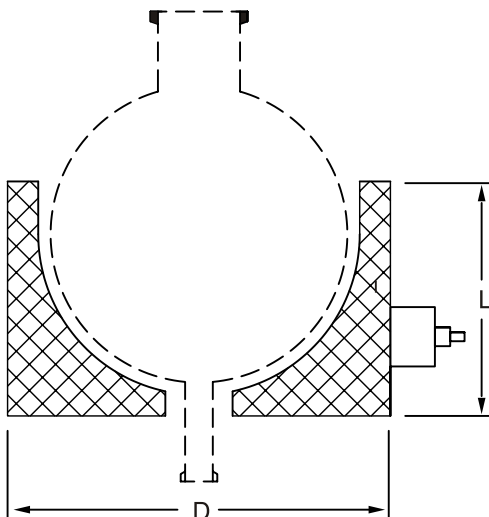
Notes:

1. Powder coating / S.S. Heating bath can be supplied on request. This should be specified during inquiry stage.
2. S.S. / Copper coil can be supplied on request. This should be specified during inquiry stage.

HEATING MANTLES

As an alternative to heating baths electric heating mantles can also be supplied for spherical vessels. Their heating power varies according to the nominal capacity of the vessel involved.

These heating mantles are subdivided into several heating zones each of which is equipped with a temperature probe so that the surface temperature of the vessel can be monitored. These work in conjunction with the control unit included in the supply to prevent local hot spots occurring. The control unit also includes energy regulators, which can be used to control the heat input separately for each heating zone depending on the liquid level.



VESSELS CAPACITY	D	L	LOADING KW	CIRCUITS	SUPPLY	CAT. REF.
5	-	-	0.6 (1x600)	1	230V	SJMD 5
10	-	-	1.0 (2X500)	3	230V	SJMD 10
20	470	245	1.5 (3X500)	3	230V	SJMD 20
50	610	305	3.6 (6X900)	3	440V	SJMD 50
100	715	360	5.4 (6X900)	3	440V	SJMD 100
200	890	450	8.1 (9X900)	3	440V	SJMD 200

Note : In all cases, electrical supply should be specified when ordering. All Heating mantle are non-flame proof type. Flame proof heating mantle can be supplied on request.

MOTOR WITH REDUCTION GEAR BOX

Flameproof motor with reduction gearbox is supplied as standard. A motor is coupled with gearbox. The other end of the gearbox is coupled with flexible shaft.

1:7 Reduction gearbox is used with motor. 1:10 reduction gearbox can also be supplied on request. This should be specified at the time of enquiry stage.

SPECIFICATION : 1400 RPM, 415V, 50Hz, 3 Phase supply, insulation class F, degree of protection : IP 55.

H.P.	SPEED	CAT. REF.
0.5	190	SFSD 0.5/190
0.5	130	SFSD 0.5/130
0.25	190	SFSD 0.25/190
0.25	130	SFSD 0.25/130

SPEED VARIATOR

Different variable speed stirrer drives are available for adjusting stirrer speeds to different operating conditions.

MECHANICAL VARIATOR

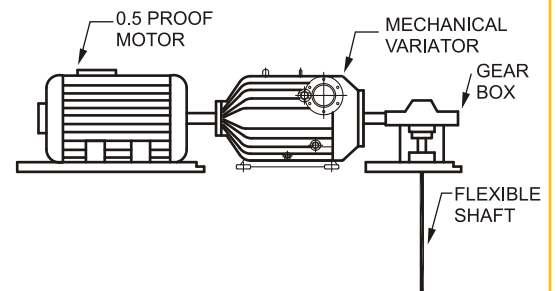
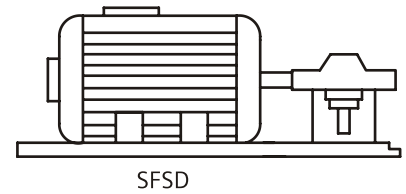
Mechanical variator have been designed for either horizontal or vertical mounting, one end of the mechanical variator is coupled with motor shaft and other end is fitted with reduction gear box. Control for speed regulation is attached to one end of the control shaft. Hand wheel control is standard control provided on the unit, where selected speed can be read on the indication drum. Variable output speed between lowest 1/7 of the input speed and highest 1.7 times of the input speed can be adjusted. The variator can run in either direction at the rated HP.

FREQUENCY VARIATOR

Non-flameproof digital microprocessor AC variable speed drives (inverters) is also available to adjust the speed of motor. This VARIATOR has got LED display for frequency, speed, setting value, voltage etc. Frequency is set by keypad or external analog signal.

Power supply: 3 Phase, 440V, 50Hz.

Flameproof version can also be supplied on request. This should be specified at the time of enquiry stage.



MEASUREMENT AND CONTROL

DIGITAL TEMPERATURE INDICATOR

This instrument is mainly used to monitor temperature of liquid in a typical glass distillation unit.

This instrument mainly consists of : temperature Indicator and Resistance Temperature Detectors (RTD). This instrument works on 230V, 50 Hz power supply. This displays the temperature in degree Centigrade (°C).

VESSEL CAPACITY (Ltr.)	RTD LENGTH	CAT. REF.
20	400	SDTI 20
50	500	SDTI 50
100	600	SDTI 100
200	700	SDTI 200

TWO POINT DIGITAL TEMPERATURE INDICATOR

This instrument is mainly used to monitor temperature of liquid in a glass vessel and temperature of vapours of reflux divider in a typical glass distillation unit. This instrument mainly consists of Temperature Indicator and Two Resistance Temperature Detectors (RTD). This instrument works on 230V, 50Hz power supply. This display temperature in degree Centigrade (°C) a switch is provided to see the two temperature alternatively.

VESSELS CAPACITY(Ltr.)	RTD LENGTH FOR VESSEL	RTD LENGTH FOR REFLUX DIVIDER	CAT. REF.
20	400	200	STDTI 20
50	500	225	STDTI 50
100	600	250	STDTI 100
200	700	300	STDTI 200

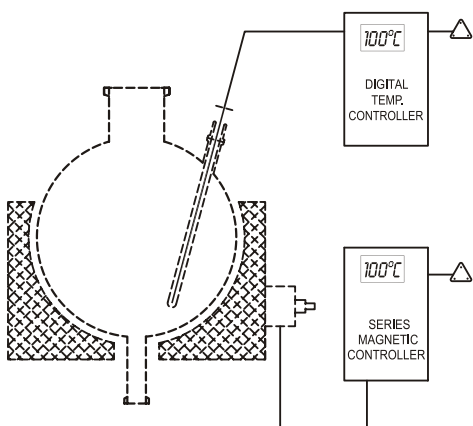
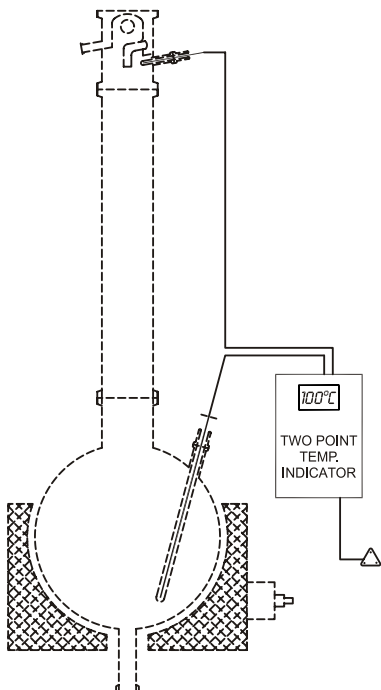
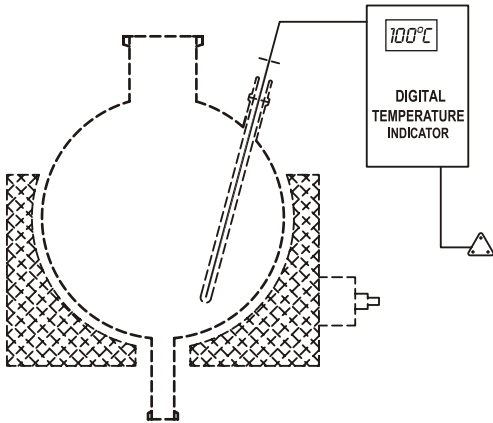
CONTINUOUS TEMPERATURE CONTROLLER

This instrument displays and controls temperature continuously by switching the power supply ON and OFF in an electrical heating equipment as per the initial settings of heating temperature, band width and reset temperature. This instrument mainly consists of a Temperature controller, a series magnetic controller and a Resistance Temperature Detectors(RTD).

RTD is put into the thermometer pocket of the glass vessel and desired settings are done. As temperature, in the vessels reaches to the set heating temperature, the temperature controller cuts the power in heating equipment OFF. Power starts ON again as the temperature goes down as per the settings of band width and reset temperature.

This instrument works on power supply of 230V 50Hz and can be used with heating mantles and heating baths of all sizes. It displays temperature in Degree Centigrade (°C).

VESSEL CAPACITY(Ltr.)	RTD LENGTH	CAT. REF.
20	400	SCTC 20
50	500	SCTC 50
100	600	SCTC 100
200	700	

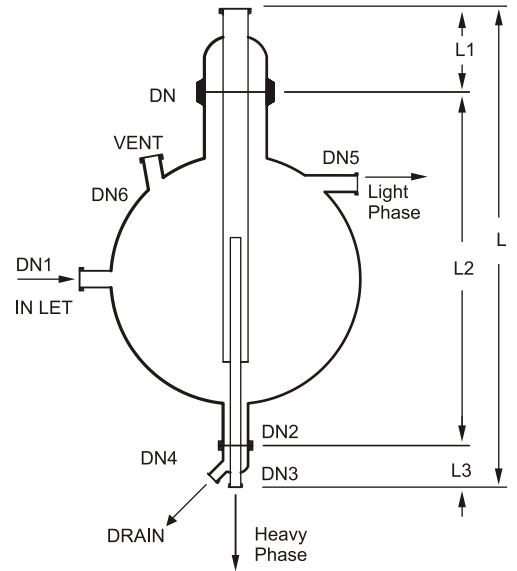


SEPARATORS

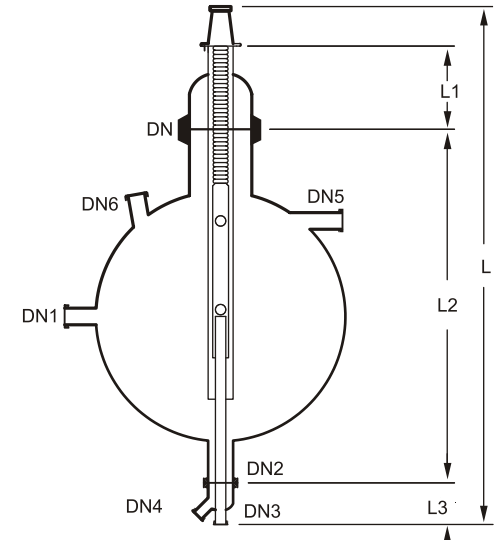
Separators are used to separate two immiscible liquids with different densities. When these liquids allowed settling forms two separate layers, heavier at bottom and lighter at up. Mixture of liquid is continuously feeded in separator at low velocity. This allow sufficient residence time for the formation 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 overflows 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 lager-separating surface. (Cat Ref. HSPS OR HSPA).

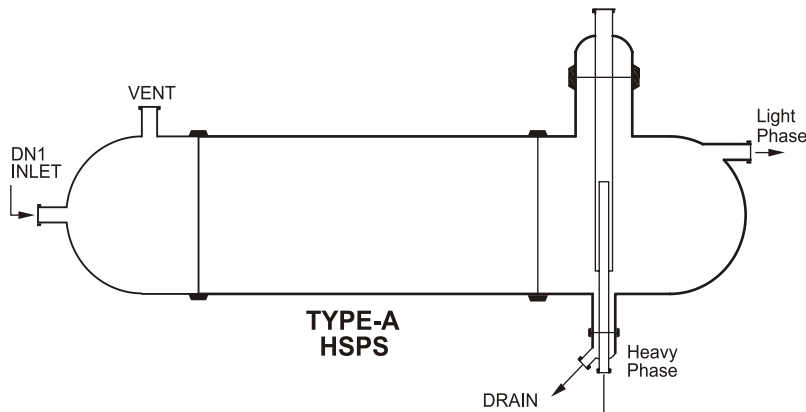
NOM. CAP	INLET DN	HEAVY PHASE OUTLET			LIGHT PHASE OUTLET VENT			L	L1	L2	L3	TYPE	CAT REF
		DN2	DN3	DN4	DN5	DN6	DN6						
20 L	80	25	50	25	25	25	25	800	125	525	-	A	SSPS20
50 L	100	40	50	25	25	40	40	1025	150	725	-	A	SSPS50
100 L	150	40	50	25	25	40	40	1175	200	825	-	A	SSPS100
200 L	225	40	50	25	25	40	40	1475	250	1075	-	A	SSPS200
20 L	80	25	50	25	25	25	25	1000	125	525	200	B	SSPA20
50 L	100	40	50	25	25	40	40	1225	150	725	200	B	SSPA50
100 L	150	40	50	25	25	40	40	1375	200	825	200	B	SSPA100
200 L	225	40	50	25	25	40	40	1675	250	1075	200	B	SSPA200



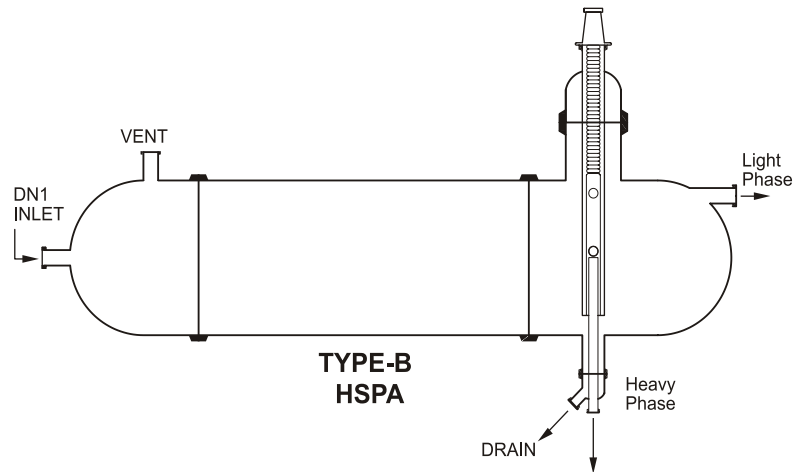
TYPE-A



TYPE-B



TYPE-A HSPS



TYPE-B HSPA

CYCLONES

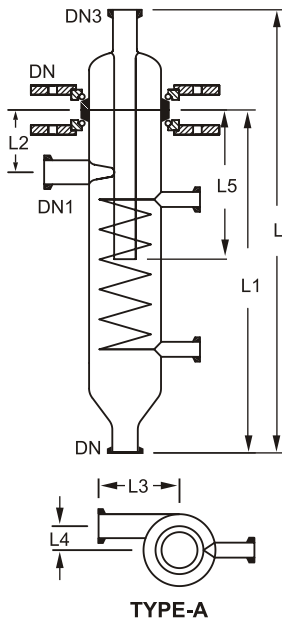
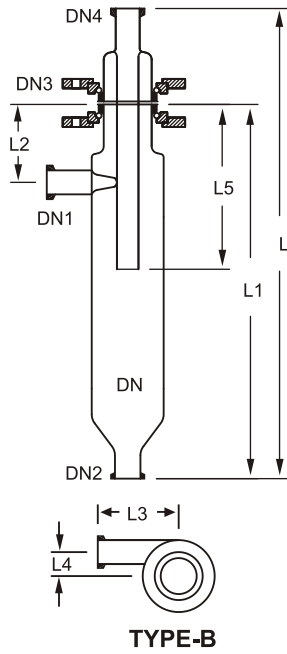
Cyclones are designed for separation not only for droplets from gases and vapours, but also for particulate solids from gases.

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.

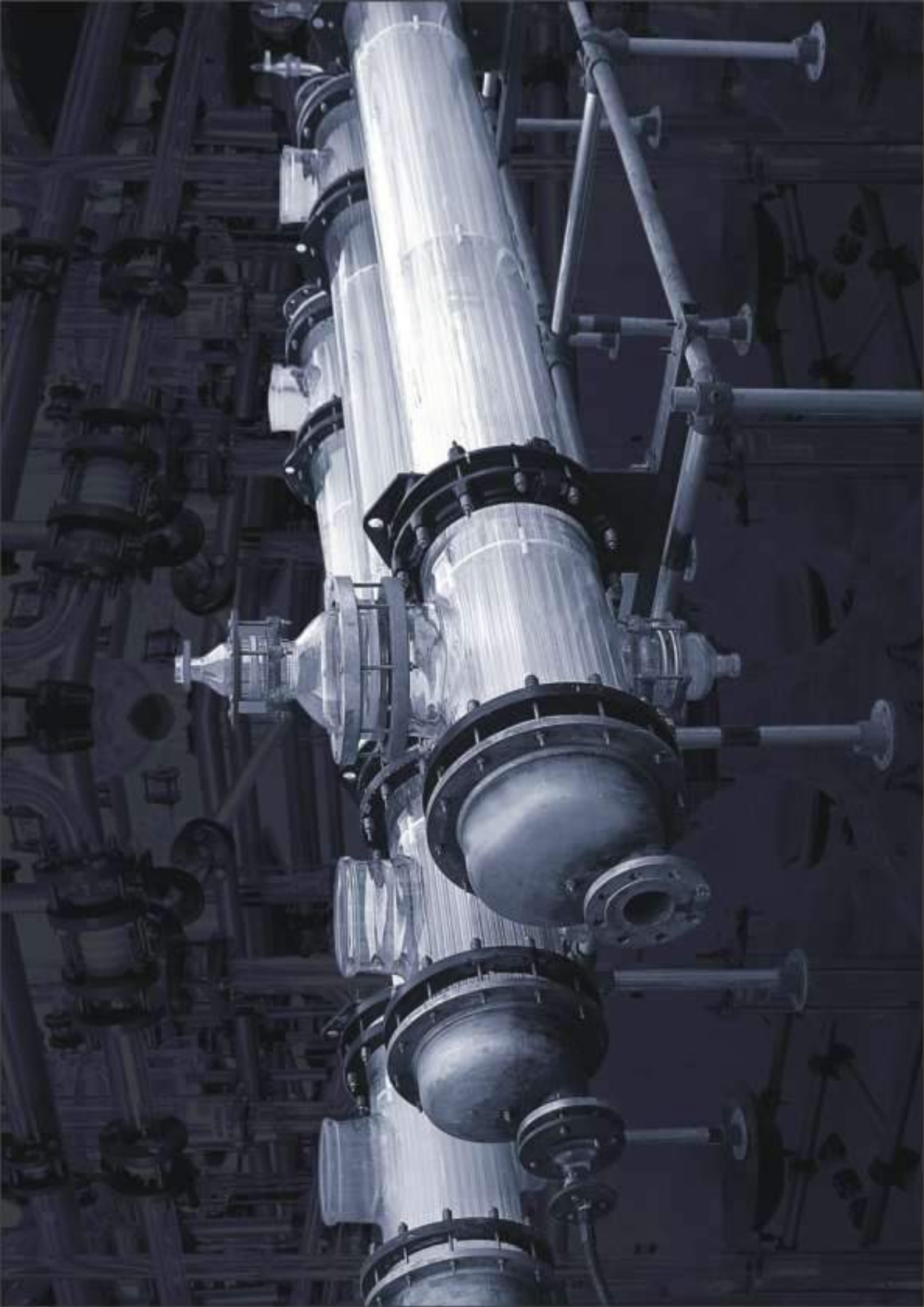
The following are examples of limiting droplet diameters for the standard air/water system (at ambient temperature) with a velocity in the dip pipe of 15m/sec.

DN	DN1	DN2	DN3	DN4	L	L1	L2	L3	L4	L5	CAT. REF.
100	40	25	80	40	715	560	130	125	35	180	SCY4
150	50	25	100	50	850	665	165	150	55	235	SCY6
225	80	25	150	80	1120	870	225	200	75	320	SCY9
300	100	25	150	100	1430	1115	285	275	100	405	SCY12



CYCLONES WITH INTERNAL COOLING COIL

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



HEAT EXCHANGERS

There are two types of glass heat exchangers, coil type and shell and tube type heat exchangers.

COIL TYPE HEAT EXCHANGERS

Coil type heat exchangers are of all-glass design. There are no internal sealing problems as the coil battery is welded into the jacket making a one piece unit. Coil type heat exchanger are used for condensation of vapours and cooling of liquid . The maximum allowable pressure in the coils is 2.7 bar gauge.

PERFORMANCE DATA

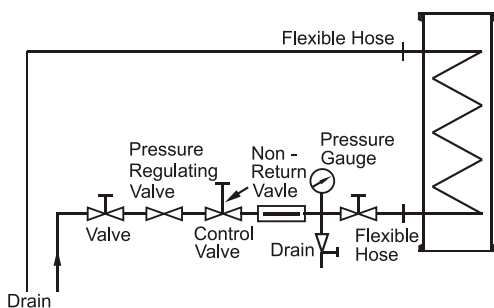
The heat transfer coefficients also varies from one size of condenser to another but as a guide, the table below gives an indication of the performance of condenser at atmospheric pressure, using water (inlet temperature 30° C) as a coolant in the coils and steam condensing in the jackets.

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 ² °c	200-250	100-150	40-60

PRECAUTIONS TO USE CONDENSER ARE AS FOLLOW :

1. When connecting coil-type condensers to the coolant supply, adequate flexible hose should be used to ensure that stresses are not transmitted to the glass.
2. Condenser should never be operated with steam in the coils. They should always be used with an adequate flow of coolant through the coils and care should be taken to ensure that the coolant does not become heated to boiling point.
3. Coolant control valves should always be turned ON and OFF slowly, particularly when air is present in the line. Coolant should be allowed to drain freely to a point as closed as practicable to the heat exchangers.
4. Care should be taken in arranging the coolant supply in order to that water hammer is avoided. A uniform, continuous supply of coolant should be ensured.
5. If a condenser is out of service for any length of time, it is advisable to drain the coils, especially in winter when suitable precautions should be taken to prevent freezing of any water remaining after draining.
6. Brine or other coolants in closed circuit can be used as a coolant provided the suitable precautions against water hammer are taken.
7. Condensers can be mounted in series to provide larger surface area. Generally condensers should be mounted vertically only.
8. The maximum pressure in the coil is 2.7 Bar g the maximum differential pressure across the coil are 2.7 Bar g.



TYPICAL CONDENSER ARRANGEMENT

GLASS CONDENSER

AREA (m ²)	DN	DN1	L	L1	L2	TYPE	COOLANT JACKET THROUGH FCSA*			
							CAP LTR.	PUT Kg/h	SHELL (cm ²)	CAT. REF
0.2	40	16	610	85	100	A	1.0	700	4.5	SHE1.5/2
0.3	50	16	610	90	100	A	1.25	1200	5	SHE2/3
0.3	80	16	610	90	100	A	2	1200	5	SHE3/3
0.5	100	20	610	120	100	A	4	2200	18	SHE4/5
0.6	100	20	760	120	100	A	6	2200	30	SHE4/6
1.0	150	25	610	150	100	B	9	2300	52	SHE6/10
1.5	150	25	840	150	125	B	11	2300	52	SHE6/15
2.5	225	25	790	180	125	B	18	3000	142	SHE9/25
2.5	300	25	610	250	125	B	25	2750	210	SHE12/25
4.0	300	25	900	250	125	B	35	4200	258	SHE12/40
4.0	400	25	600	350	125	B	55	4800	450	SHE16/40
5.0	400	25	700	350	125	B	65	5800	450	SHE16/50
6.0	450	25	760	325	150	B & C	100	5800	820	SHE18/60
8.0	450	25	900	325	150	B & C	110	6100	820	SHE18/80

Note : L1 / L2 may be ± 10 mm.

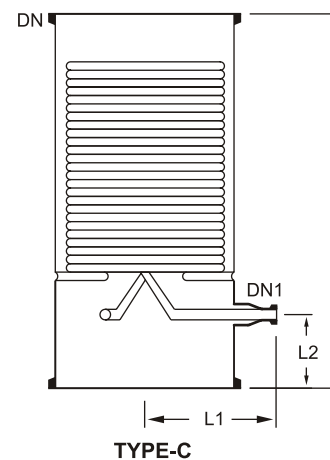
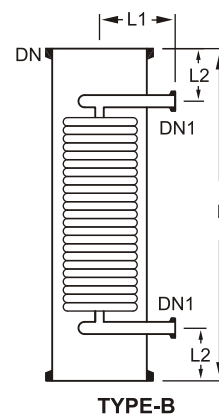
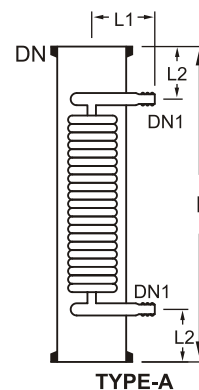
* FCSA - Free Cross Section Area.

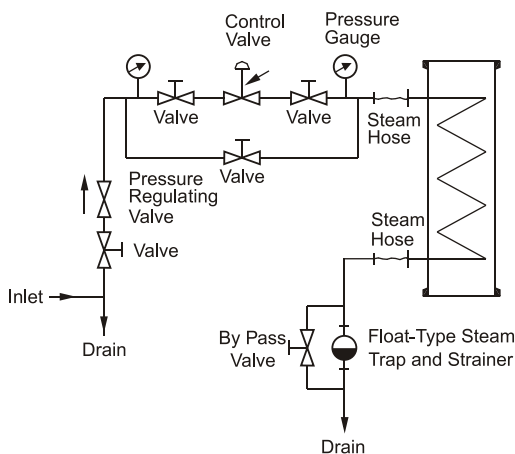
GLASS BOILER

Type SHEB 4, SHEB 6 and SHEB 9 glass coil-type boiler are normally mounted in external circulatory loops using a spherical vessel as the main still. They should not be installed in the bottom of a flask or column.

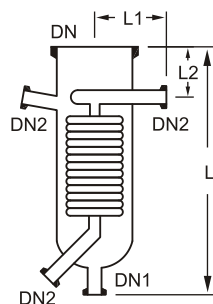
The other types of glass coil-type boilers detailed on this page are again mounted in circulatory loops but as their nominal bore is same at the top and bottom, these units can, under certain circumstances, be installed one above the other to achieve multiples of the basic heat transfer area.

The maximum pressure in the coils is 3.0 barg. The maximum differential pressure across the coils is 3.0 bars. Please refer to the performance data for glass coil-type.

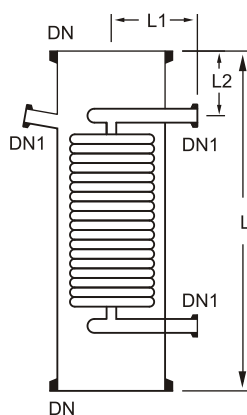




TYPICAL BOILER ARRANGEMENT



TYPE-A



TYPE-B

PERFORMANCE DATA

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

The heat transferred in most sizes can be considered on average as 250 Kcal/hr – m² °c a steam pressure in the coils of 3.0 Bar g, although this figure declines marginally at lower pressure.

PRECAUTIONS TO USE GLASS BOILER ARE AS FOLLOW :

1. Flexible hoses must be used on the coil inlet and outlet and must have sufficient fall to avoid the collection of condensate.
2. To avoid the possibility of steam hammer, the steam main should be adequately trapped.
3. To clear the line of the very heavy condensate flow produced on start-up by-pass valves must be installed around the trap on the coil outlet.
4. Control valves and pressure gauges should be positioned near to the heat exchanger.
5. Coil type boilers should not be fitted at the bottom of flasks or columns. They are designed to be mounted on an external circulatory loop, this ensures a rapid uni-directional flows across the heating surfaces, which improves the heat transfer performance and promotes smooth operation.
6. The steam pressure should always be adequate enough to ensure effective and smooth condensate removal. This pressure will vary according to conditions of use and size of heat exchanger. For example, with the SHEB 12/12 and SHEB 450, a minimum pressure of 2 bar.g will probably be required.
7. On start-up, the steam should be admitted positively and progressively to the coil battery to remove the condensate as it is formed and with the by-pass valve left open until a uniform flow of condensate is being vented.
8. Depending upon the overall operating conditions, the use of boilers under high vacuum is not always recommended.

Area (m ²)	FCSA						Area L2	Jacket Cap. (cm ²)	Jacket Ltr.	Type	Cat. Ref.
	DN	DN1	DN2	L	L1	Area L2					
0.15	100	25	25	380	125	100	40	2	A	SHEB4	
0.15	100	25	-	405	125	100	41	3	B	SHEB4/4	
0.50	150	40	25	455	150	90	51	5	A	SHEB6	
0.50	150	25	-	510	150	100	51	7	B	SHEB6/6	
1.50	225	40	25	710	180	140	147	16	A	SHEB9	
1.20	225	25	-	710	180	115	193	20	B	SHEB9/9	
2.00	300	25	25	700	215	135	330	40	B	SHEB12/12	

* FCSA - Free Cross Section Area.

IMMERSION HEAT EXCHANGERS

Immersion heat exchangers are used to control exothermic reactions in glass vessels.

In most applications, cooling water is used in the coils, but they can also be used with steam.

In the latter case the coils must always be completely immersed in the liquid. The maximum pressure in the coils is 3.0 bar g. the maximum differential pressure across the coils is 3.0 Bar g.

Area (m ²)	DN	DN1	DN2	L	L1	D	Cat Ref
0.50	150	40	25	230	330	145	SHEM 6
0.70	225	25	25	275	205	210	SHEM 9

PRODUCT COOLERS

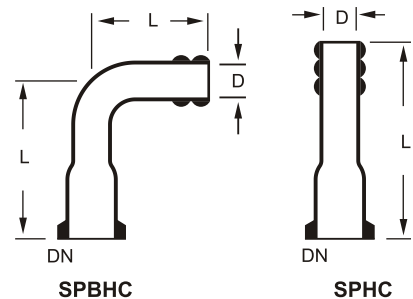
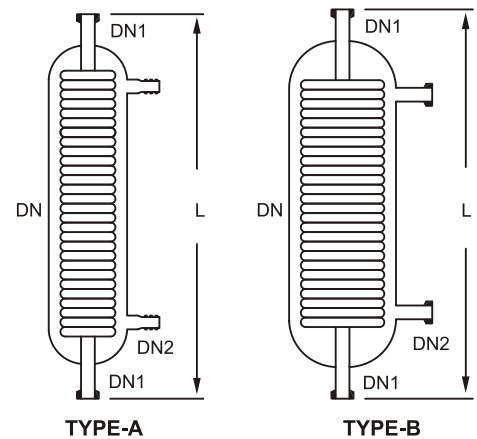
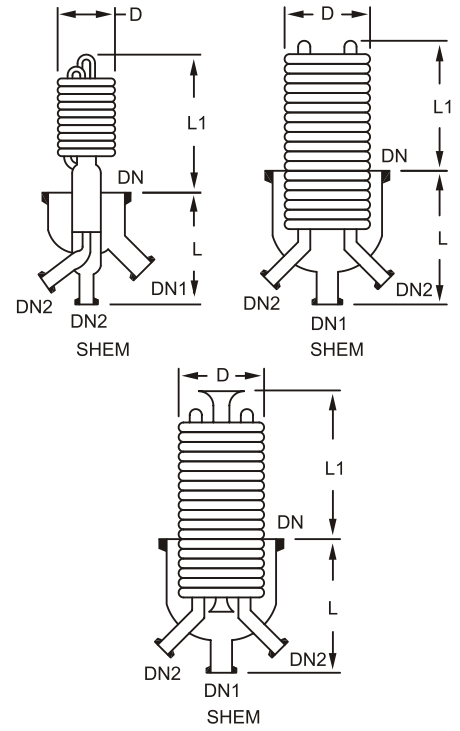
Product coolers are general-purpose coolers used for cooling of products from distillation columns. Coolers are connected directly to the product outlet of the column by means of DN1. The product then flows from the top to the bottom of the unit through the coil battery across which the cooling water flows counter currently from bottom to top.

Angled hose connections are recommend for connections of cooling water Inlets and Outlets.

Area (m ²)	DN	DN1	DN2	L	Type	Cat Ref
0.1	40	25	16	610	A	SHEF 1/1
0.2	50	25	16	610	A	SHEF 1/2
0.3	80	25	16	610	A	SHEF 1/3
0.35	100	25	19	610	A	SHEF 1/3.5
0.50	150	25	25	610	B	SHEF 1/5
1.00	150	25	25	840	B	SHEF 1/10

HOSE CONNECTOR

These glass connectors are used to connect flexible hoses to inlet and outlet of coil type condensers.



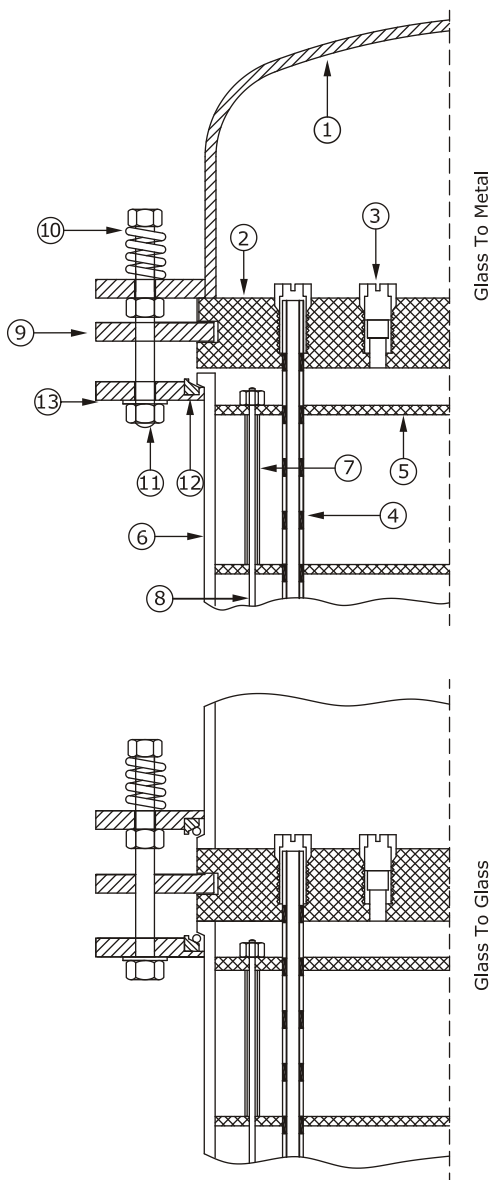
SHELL AND TUBE HEAT EXCHANGERS

Shell and tube heat exchangers are available in various options depending upon the required application, which are mentioned as under. Shell and tube heat exchangers are particularly suitable for applications where a large heat transfer area is required in a relatively confined space.

Shell & tube heat exchangers are available in single-pass as well as multi-pass on the tube side. Material of construction of tube is Borosilicate Glass (3.3)

Range of the models

Cat.Ref.	Shells	End Fittings	Tubes	Number of passes
SRGG	Glass	Glass	Glass	1
SRGM	Glass	Steel	Glass	1/2/3
SRMG	Steel	Glass	Glass	1



CONSTRUCTION FEATURES

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

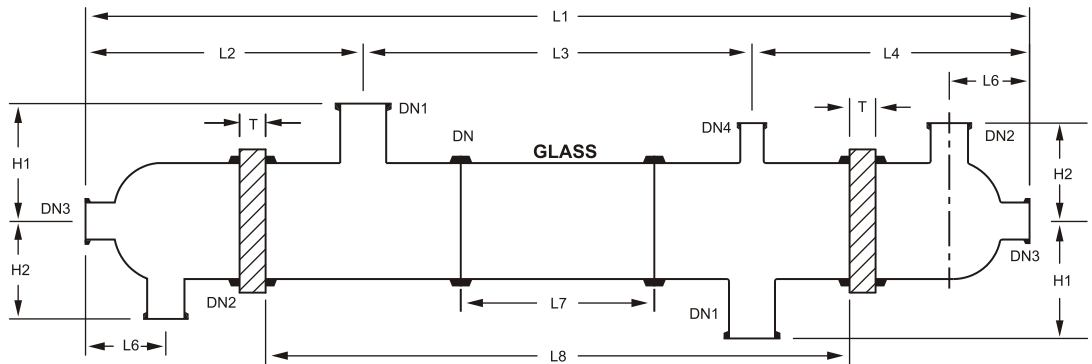
Sealing principle similar on all models

- 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

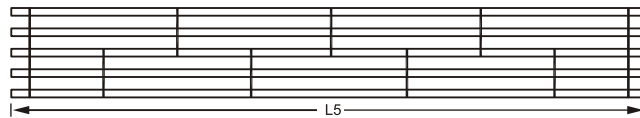
Cat Ref.	6/3	6/4	6/5	6/6	9/6	9/8	9/10	9/12	12/12	12/16	12/21	12/26
Area (m ²)	3	4	5	6	6	8	10	12.5	12	16	21	26
DN		150					225				300	
DN1		80					100				150	
DN2		50					50				80	
DN3		25					40				40	
DN4		50					50				50	
H1		175					250				300	
H2		150					205				240	
L1	2534	3034	3834	4534	2864	3364	4164	4864	2916	3416	4216	4916
L2	440	440	440	440	690	690	690	690	730	730	730	730
L3	1650	2150	2950	3650	1480	1980	2780	3480	1450	1950	2750	3450
L4	440	440	440	440	690	690	690	690	730	730	730	730
L5	2030	2530	3330	4030	2030	2530	3330	4030	2030	2530	3330	4030
L6	155	155	155	155	175	175	175	175	200	200	200	200
L7	1350	1850	2650	3350	1030	1530	2330	3030	1000	1500	2300	3000
L8	1960	2460	3260	3960	1940	2440	3240	3940	1910	2410	3210	3910
No. of Tubes		37					73				151	
No. of Baffles	11	14	19	24	7	9	13	17	5	7	10	13
T		50					60				75	

All glass tubes have an external diameter of 13mm or 14mm and a wall thickness of 1 mm.

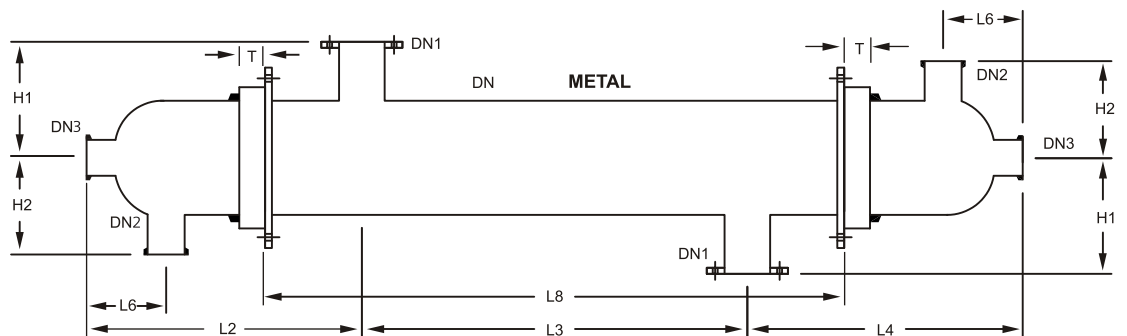
SRGG



TUBE BUNDLE



SRMG



OPERATING RANGE

The maximum permissible operating conditions in borosilicate glass 3.3 heat exchangers are detailed in the table below.

Permissible operating pressure range (Bar g)

Models	Side	DN 150	DN 225	DN 300
SRGG	Shell	2.0	1.0	0.75
	Tube	2.0	1.0	0.75
SRGM	Shell	2.0	1.0	0.75
	Tube	3.0	3.5	3.5
SRMG	Shell	3.5	3.5	3.5
	Tube	2.0	1.0	0.75

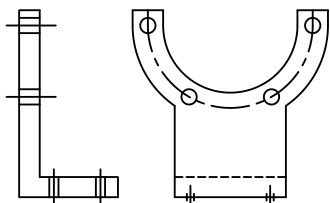
Maximum operating temperature
shell and tube sides: - 40° C to 150° C.

Maximum temperature difference between the
shell side and tube side process fluids : 120° C.

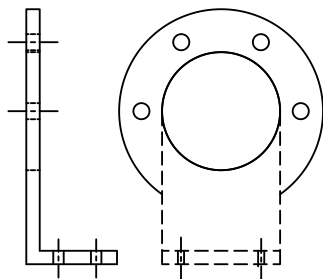
PERFORMANCE & DESIGN DATA:

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	Basis	Kcal/m ² 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



SUPPORTS FOR GLASS SHELL



SUPPORTS FOR METAL SHELL

SUPPORTS :

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

MOC of these supports is MS.



COLUMN COMPONENTS

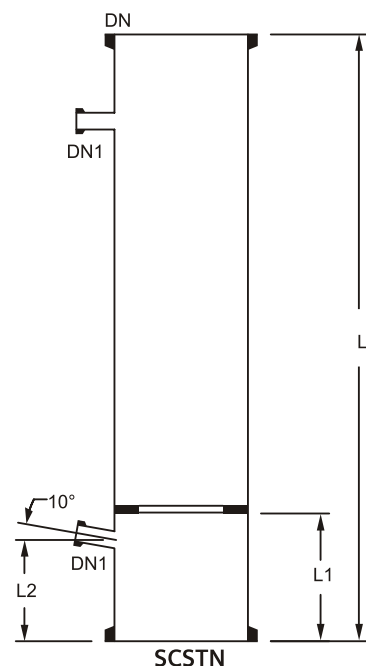
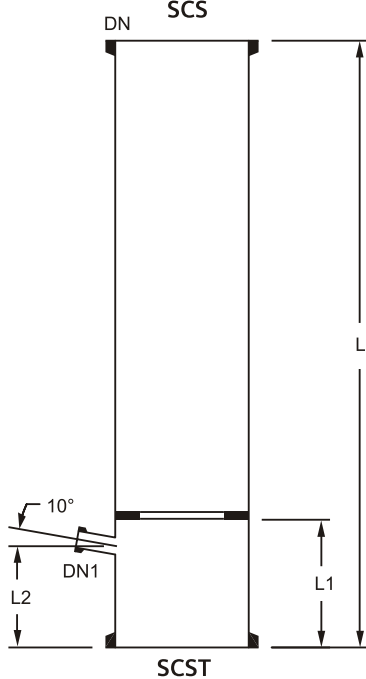
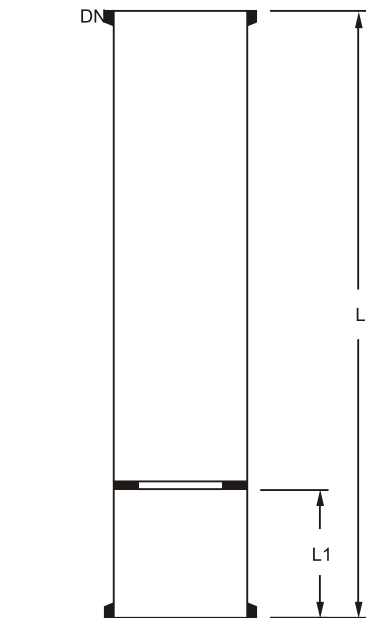
Column components are widely used in chemicals, pharmaceutical and allied industries together with other applications e.g. food and drink production, dye works and electroplating. This is because of the special properties of borosilicate glass 3.3 and PTFE together with special materials that are used in some instances for internals, plus the fact that borosilicate glass 3.3 is an approved and proven material of construction for pressure vessels.

1. With almost universal resistance to corrosion, a long service life is guaranteed and maintenance is kept to a minimum.
2. Their transparency permits constant visual monitoring of the process at all times.
3. Being inert, the risk of contamination is negligible.
4. Smooth surface allow easy cleaning and sterilization and prevent the build-up of solids on the inner walls.

COLUMN SECTIONS

All column sections are supplied complete with support. The packing must be ordered separately.

On special request. A column sections can be supplied without the packing support. Column sections and pipe sections may be used for the construction of columns of all nominal bores provided that the weight of the packing and retained liquid does not exceed the load-bearing capacity of the support. Column section can also be provided with a thermometer branch below the packing support.



DN	DN1	L	L1	L2	CAT. REF. SCS / SCST / SCSTN
80	25	1000	125	100	3/1000
100	25	1000	125	100	4/1000
150	25	1000	125	100	6/1000
225	25	1000	125	100	9/1000
225	25	1500	150	125	9/1500
300	25	1000	150	125	12/1000
300	25	1500	150	125	12/1500
400	25	1000	200	150	16/1000
400	25	1500	200	150	16/1500
450	25	1000	200	150	18/1000
450	25	1500	200	150	18/1500
600	25	1500	200	150	24/1500

PACKING SUPPORTS

Two types of packing supports Type A or Type B. Type A are made of fused glass rods and Type B (heavy duty) are made of glass plates vertically arranged and tied with PTFE tie rods.

Standard packing supports for columns DN 80 to DN 300 are manufactured from borosilicate glass. From DN 400 and above, a combination of glass and PTFE is used for their construction, thus maintaining maximum resistance to corrosion.

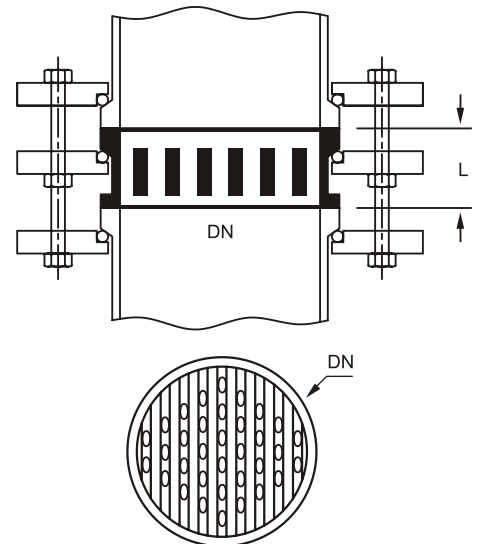
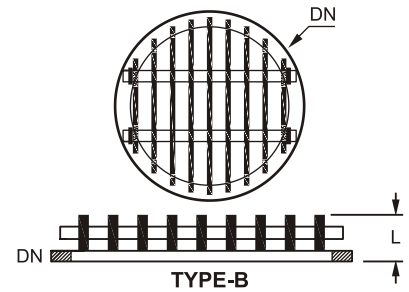
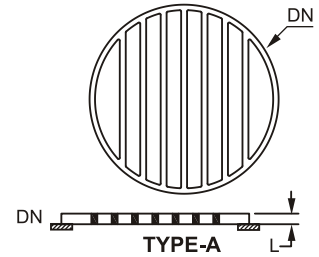
DN	L	MAXIMUM LOAD (Kg)	MAXIMUM PACKING SIZE (mm)	TYPE	CAT. REF.
80	20	10	12	A	SLB 3
100	20	15	15	A	SLB 4
150	30	30	25	A	SLB 6
225	30	50	25	A	SLB 9
300	30	75	25	A	SLB 12
400	70	150	25	B	SHD 16
450	70	200	25	B	SHD 18
600	95	300	40	B	SHD 24

SUPPORT PLATE ASSEMBLY

If free cross-section obtained with the combination of column section and packing support are not large enough, then an alternative is to be used with pipe sections in combination with fixed support plate.

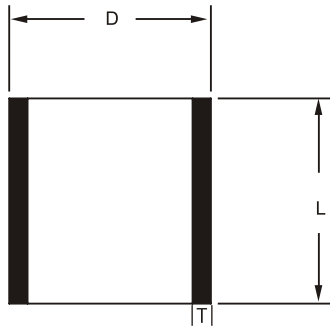
Each item comprises glass support plate, screwed rod with nuts, flat washers, compression springs and special backing flange for assembly.

DN	L	MAXIMUM LOAD (Kg)	CAT. REF.
80	25	10	SLBE 3
100	25	15	SLBE 4
150	50	30	SLBE 6
225	50	50	SLBE 9
300	50	75	SLBE 12



COLUMN PACKING RASCHING – RINGS

Rasching rings up to 25mm are made of neutral glass. 40mm and 50mm Rasching Rings are available in borosilicate glass.



D X L	WALL THICKNESS (T)	BULK DENSITY (Kg/Ltr.)	SPECIFIC SURFACE (M ² /M ³)	CAT. REF.
8 X 8	1.0	0.60	500	SFC 8
12 X 12	1.0	0.50	400	SFC 12
15 X 15	1.6	0.75	300	SFC 15
20 X 20	1.1	0.45	280	SFC 20
25 X 25	2.0	0.27	200	SFC 25
30 X 30	2.0	0.40	176	SFC 30
40 X 40	1.75	0.27	160	SFC 40
50 X 50	2.0	0.25	120	SFC 50

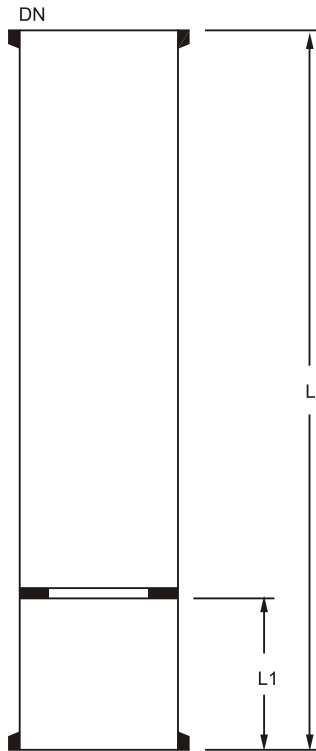
PACKINGS REQUIRED FOR VARIOUS COLUMN SECTIONS (Kgs.)

PACKING SIZE (mm)

COLUMN SECTION SIZE	Vol LITER	SFC 8	SFC 12	SFC 15	SFC 20	SFC 25	SFC 30	SFC 40	SFC 50
SCS 3/1000	4.4	2.6	2.2	3.3	2.0	1.2	1.8	1.2	1.1
SCS 4/1000	7.6	4.6	3.8	5.7	3.4	2.1	3.0	2.1	1.9
SCS 6/1000	15.5	9.3	7.8	11.6	7.0	4.2	6.2	4.2	3.9
SCS 9/1000	31.8	19.1	15.9	23.9	14.3	8.6	12.7	8.6	8.0
SCS 12/1000	61.9	37.1	31.0	46.4	27.9	16.7	24.8	16.7	15.5
SCS 16/1000	110	66.0	55.0	82.5	49.5	29.7	44.0	29.7	27.5
SCS 18/1000	145	87.0	72.5	108.8	65.3	39.2	58.0	39.2	36.3
SCS 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

1. Due to their low bulk density, glass rasching rings are particularly suitable for packing glass columns.
2. Generally the ratio of column diameter to packing diameter should not be less than 8:1.
3. When using smaller packing size, a small layer of larger packing should be used on packing support, to prevent the smaller packing falling through.
4. 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 above the packed section.



PTFE RE-DISTRIBUTORS

PTFE re-distributors are installed in the same way as gaskets between two flat buttress end faces and therefore when using them, no gasket is required.

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

PACKING RETAINERS / PTFE PERFORATED PLATES

Packing retainers are installed above packed column section to prevent any carry-over of column packing. They are installed in the same way as gaskets between two flat buttress end faces and therefore no gasket is required. Packing retainers are manufactured from PTFE for maximum resistance to corrosion. They cannot be used as packing supports.

DN	L	FREE CROSS SECTION AREA (%)	CAT. REF.
80	7	80	SCPP 3
100	7	90	SCPP 4
150	7	90	SCPP 6
225	10	95	SCPP 9
300	10	85	SCPP 12

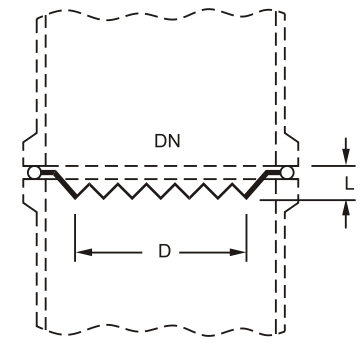
COLUMN FEED PIPE

Column feed pipes are designed for application in which there is need to introduce the process liquid at a single point. They are usually installed SPTU unequal tee piece (see Chapter 2 of this catalogue - Pipeline Components) and used as a distribution tube, which directs the fluid down onto center of column packing.

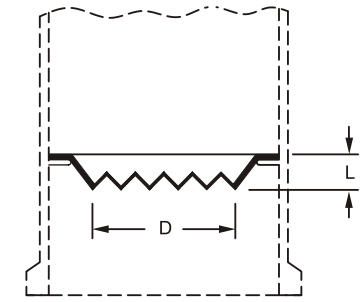
Column feed pipes are available for 80 DN to 600 DN column. Two types of column feed pipes are available as under :

- (1) Dip pipe type (Type-A) (2) Plate type (Type-B)

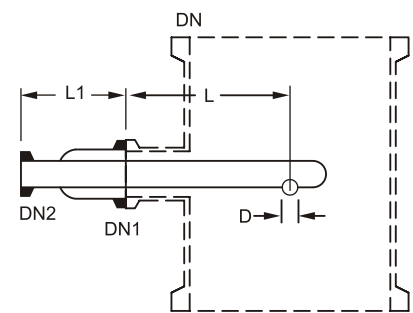
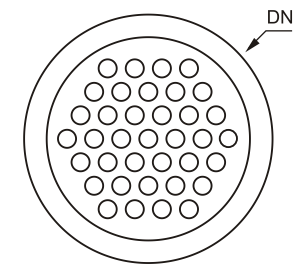
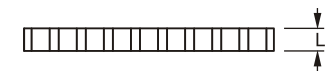
DN	DN1	DN2	D	L	L1	CAT. REF.
80	40	25	13	100	115	SFP 3
100	40	25	13	125	115	SFP 4
150	40	25	13	150	115	SFP 6
225	40	25	13	185	115	SFP 9
300	40	25	13	230	115	SFP 12
450	80	40	25	320	150	SFP 18
600	150	50	40	450	200	SFP 24



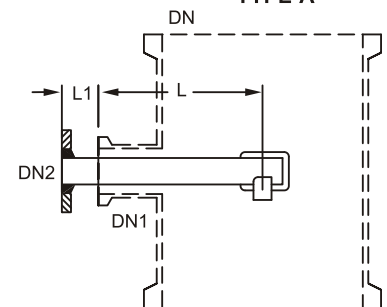
TYPE-A



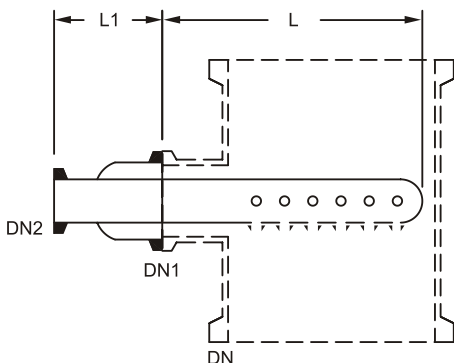
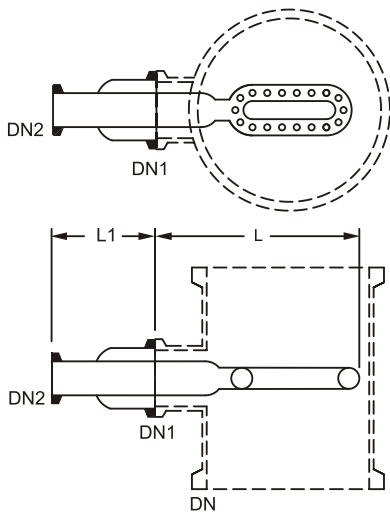
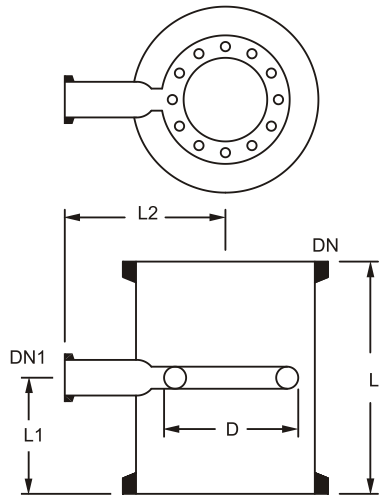
TYPE-B



TYPE-A



TYPE-B



SPRAY FEED SECTIONS

Spray feed sections are provided with circular tube having holes at bottom

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

SPRAY FEED PIPES

Like column feed pipes, spray feed pipes are usually installed via a SPTU unequal tee piece. Spray feed pipes sections are provided with oval tube having holes at bottom.

DN	DN1	L	L1	L2	DIA OF HOLE X NO. OF HOLES	CAT. REF.
150	80	25	225	125	2 x 27	SFD 6
225	100	25	325	150	2 x 27	FSD 9
300	150	25	400	200	3 x 30	FSD 12
450	150	50	500	200	3 x 40	SFD 18
600	150	50	600	200	3 x 60	SFD 24

COLUMN FEED SPARGER

In column feed sparger holes are provided at three sides of pipe.

DN	DN1	L	L1	L2	DIA OF HOLE X NO. OF HOLES	CAT. REF.
80	25	25	125	100	2 x 21 No.	SSPG 3
100	25	25	150	100	2 x 21 No.	SSPG 4
150	40	25	200	100	2 x 27 No.	SSPG 6
225	40	25	275	100	2 x 27 No.	SSPG 9
300	40	25	350	100	3 x 30 No.	SSPG 12
450	40	25	500	100	3 x 39 No.	SSPG 18
600	50	40	650	100	3 x 60 No.	SSPG 24

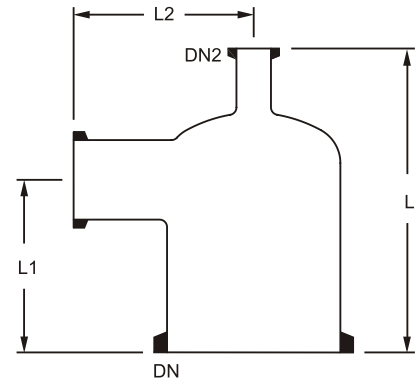
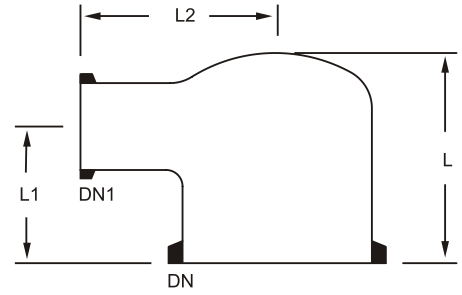
COLUMN ADAPTORS - FLAT TOP

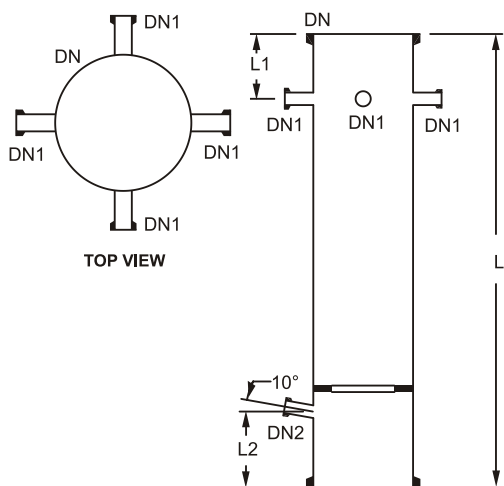
These are generally used as end bonnets of shell & tubes heat exchangers and columns.

DN	DN1	L	L1	L2	CAT. REF.
150	40	155	110	165	SFH 6/1.5
225	40	165	120	200	SFH 9/1.5
300	40	190	140	240	SFH 12/1.5
450	40	285	175	300	SFH 18/1.5
450	150	420	310	380	SFH 18/6

COLUMN ADAPTORS

DN	DN1	DN2	L	L1	L2	CAT. REF.
80	25	25	180	90	95	SCA 3/1/1
80	40	25	180	90	110	SCA 3/1.5/1
100	25	25	205	100	110	SCA 4/1/1
100	40	25	205	100	120	SCA 4/1.5/1
100	40	40	205	100	120	SCA 4/1.5/1.5
100	50	25	230	125	125	SCA 4/2/1
100	50	40	230	125	125	SCA 4/2/1.5
100	100	40	300	150	205	SCA 4/4/1.5
150	40	25	240	125	145	SCA 6/1.5/1
150	50	25	240	125	150	SCA 6/2/1
150	80	25	255	125	165	SCA 6/3/1
150	100	25	305	150	205	SCA 6/4/1
150	40	40	240	125	145	SCA 6/1.5/1.5
150	50	40	240	125	150	SCA 6/2/1.5
150	40	50	255	125	145	SCA 6/1.5/2
150	50	50	255	125	150	SCA 6/2/2
225	40	25	330	150	185	SCA 9/1.5/1
225	50	25	330	150	190	SCA 9/2/1
225	40	40	330	150	185	SCA 9/1.5/1.5
225	50	40	330	150	190	SCA 9/2/1.5
225	80	40	405	230	205	SCA 9/3/1.5
225	100	40	405	230	240	SCA 9/4/1
225	150	40	405	230	265	SCA 9/6/1.5
225	50	50	355	150	190	SCA 9/2/2
300	40	25	380	190	220	SCA 12/1.5/1
300	40	40	380	190	220	SCA 12/1.5/1.5
300	50	40	380	190	230	SCA 12/2/1.5
300	100	40	430	230	280	SCA 12/4/1.5
300	150	40	430	230	305	SCA 12/6/1.5
300	50	50	405	190	230	SCA 12/2/2
300	80	40	430	230	240	SCA 12/3/1.5
300	80	50	430	230	240	SCA 12/3/2
300	100	50	430	230	280	SCA 12/4/2
300	150	50	430	230	305	SCA 12/6/2
300	100	100	430	230	275	SCA 12/4/4
450	50	25	450	275	300	SCA 18/2/1
450	150	50	550	300	380	SCA 18/6/2
450	225	50	760	380	405	SCA 18/9/2
600	150	50	660	300	450	SCA 24/6/2
600	225	50	700	350	470	SCA 24/9/2
600	300	100	800	400	525	SCA 24/12/4





COLUMN SECTION FOR LIQUID RE-DISTRIBUTION TRAYS

These special column sections are designed specifically for use with type liquid distribution trays (SFVE). They are supplied complete with optional thermometer branch. (See Cat. Ref. SCSTV for thermometer branch in column section.) Column is supplied with 3 sides holding a liquid distribution tray on top if the column at required distance.

DN	L	DN1	DN2	L1	L2	CAT. REF.	CAT. REF.
225	1500	40	25	110	125	SCSV9/1500	SCSTV9/1500
300	1500	40	25	160	125	SCSV12/1500	SCSTV12/1500
450	1500	40	25	150	125	SCSV18/1500	SCSTV18/1500
600	1500	40	25	220	125	SCSV24/1500	SCSTV24/1500

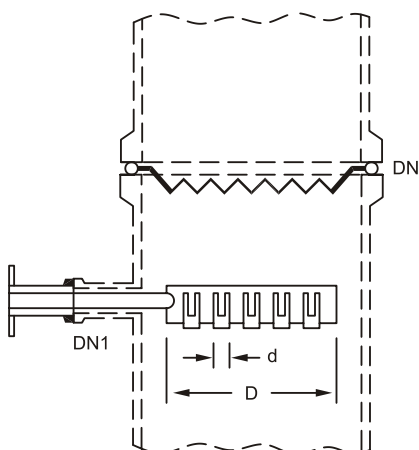
Cat. Ref. SCSV refers without thermometer branch.

Cat. Ref. SCSTV refers out thermometer branch.

LIQUID RE-DISTRIBUTION TRAYS

When used below a PTFE re-distributor, these glass/PTFE distribution trays ensure return of the liquid from the edge of the column and optimum re-distribution. They are installed in type SCSV or SCSTV column sections.

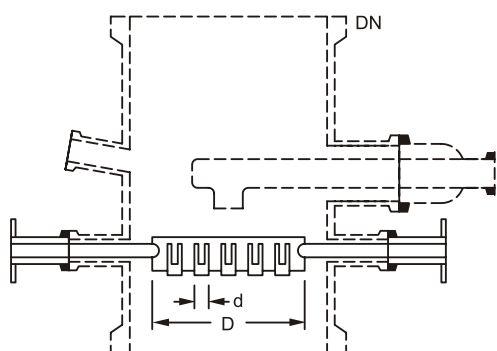
The complete item comprises the tray, support fingers and coupling and gasket to fix them into position.



DN	DN1	D	d	NUMBER of d	CAT. REF.
225	40	165	18	9	SFV 9
300	40	230	18	19	SFV 12
450	40	345	28	19	SFV 18
600	40	470	28	31	SFV 24

DISTRIBUTION TRAYS FOR LIQUID FEED

These glass/PTFE distribution trays together with type SFVP inlet feed pipes detailed below are installed via type SFVZ feed sections. They provide an even initial distribution over the column cross-section. The complete item comprises the trays, support fingers and coupling and gaskets to fix them into position.



DN	D	d	NUMBER OF d	CAT. REF.
225	165	18	8	SFVE 9
300	230	18	18	SFVE 12
450	345	28	18	SFVE 18
600	468	28	30	SFVE 24

INLET FEED PIPES FOR FEED SECTIONS

These feed pipes are designed specifically for use with the distribution trays.

DN	DN1	DN2	L1	L2	CAT. REF.
225	80	25	210	150	SFVP 9
300	80	25	240	150	SFVP 12
450	80	40	320	150	SFVP 18
600	150	50	450	200	SFVP 24

FEED SECTION FOR DISTRIBUTION TRAYS

Distribution plates for liquid feed together with inlet feed pipes, are installed via these special feed sections.

They are basically unequal tee pieces with three additional branches for installing the distribution plates and a branch for a thermometer.

DN	DN1	DN2		L	L1	L2	L3	L4	CAT. REF.
		x 3 No.	DN3						
225	80	25	25	300	210	110	150	150	SFVZ 9
300	80	25	25	400	240	160	210	200	SFVZ 12
450	80	40	25	400	320	135	210	200	SFVZ 18
600	150	50	25	600	450	220	300	300	SFVZ 24

REFLUX SEPARATORS - MANUALLY OPERATED

In these units, the reflux is adjusted by means of a valve on the outlet connection.

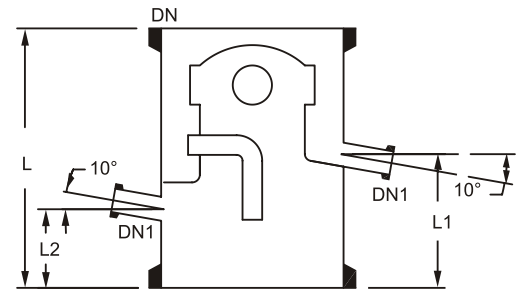
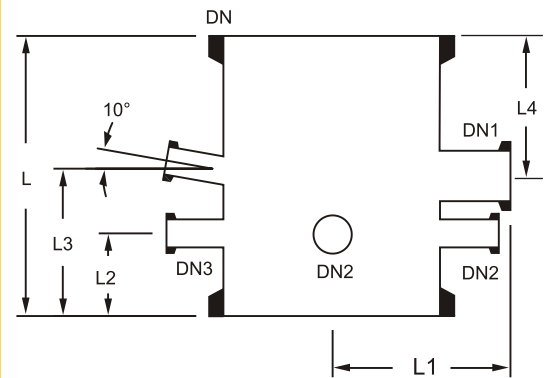
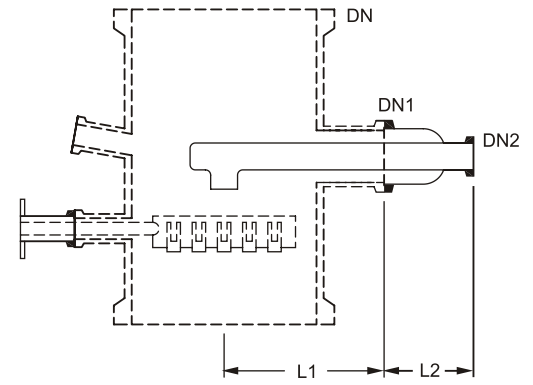
When the valve is fully opened the divider is set to total distillate off-take,

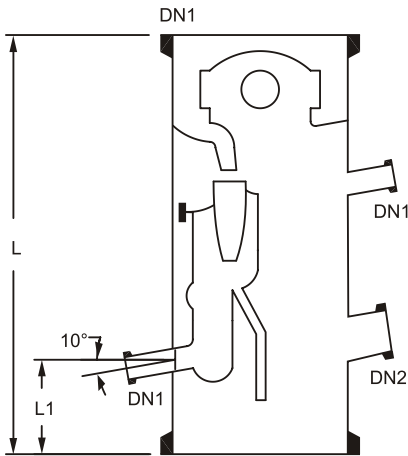
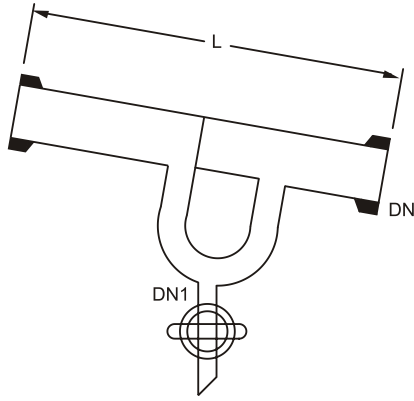
Since the reflux pipe is higher than the outlet connection, by regulating the valve, the reflux ratio can be continuous adjusted up to total.

DN	DN1	L	L1	L2	CAT. REF.
80	25	190	115	82	SRDA3
100	25	255	145	95	SRDA4
150	25	255	145	100	SRDA6
225	25	380	165	115	SRDA9
300	25	380	165	110	SRDA12
450	40	610	275	150	SRDA18

FLOW DATA FOR SRDA

MINIMUM SPACE CROSS-SECTION FOR VAPOURS (cm ²)	MAXIMUM DISTILLATE VOLUME IN RELATION TO WATER AT 20°C (l/h)	CAT. REF
10	300	SRDA 3
20	475	SRDA 4
40	700	SRDA 6
150	900	SRDA 9
170	1100	SRDA 12
670	1500	SRDA 18





LIQUID SEALS

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

DN	DN1	L	CAT. REF.
25	25	160	SLS 1
40	25	315	SLS 1.5

REFLUX SEPARATORS - AUTOMATICALLY OPERATED (MAGNETICALLY)

In application where there is need for the reflux to be at a fixed value, then it is advisable to fit an electro-magnetically or pneumatically operated reflux separators in conjunction with timer. Automatically controlled reflux separators are detailed below.

This type of reflux separator uses a swinging funnel mechanism. The funnel, which has a soft iron core sealed into it, is operated magnetically from outside the column so that the condensate can be removed from the column and reflux returned to the column in correct ratio. Activation of the electro-magnet moves the funnel into the off-take position. The electro-magnet (shown dotted) and timer should be ordered separately. Main hole (DN2) is provided for SRHM 9 and above sizes.

DN	DN1	DN2	L	L1	CAT. REF.
80	25	-	380	75	SRHM 3
100	25	100	455	90	SRHM 4
150	25	100	455	90	SRHM 6
225	25	100	560	115	SRHM 9
300	25	100	685	125	SRHM 12
450	40	100	915	165	SRHM 18

FLOW DATA FOR SRHM

MINIMUM SPACE CROSS-SECTION FOR VAPOURS (cm ²)	MAXIMUM DISTILLATE VOLUME IN RELATION TO WATER AT 20°C (l/h)	CAT. REF
10	90	SRHM 3
20	180	SRHM 4
40	300	SRHM 6
150	525	SRHM 9
170	675	SRHM 12
670	1350	SRHM 18

ELECTRO – MAGNET

Electro-magnets are used to operate magnetically operated Reflux dividers. When 'ON' the magnet attracts the swinging funnel of the reflux divider so that distillate can be taken off.

Electro-magnets are to be mounted outside OFF the glass column, just near to the reflux divider, with the help of adjustable fittings. These are designed to use with Timers to maintain correct ratio between 'OFF and 'ON' timings of its activation.

Electro-magnets work on 220V DC power supply, for which a output socket is provided in the Timers.

CAT. REF.	TYPE
SRPM	Non-flameproof
SRPF	Flameproof

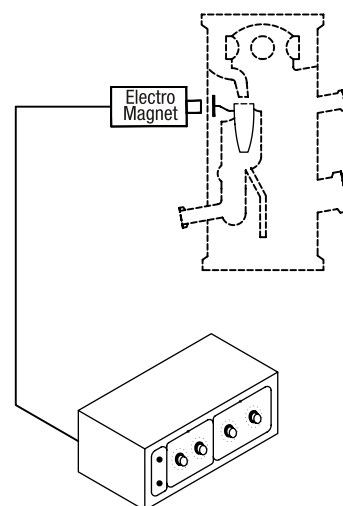
TIMERS

Timers are designed to use with Electro-magnets to provide a correct ratio of reflux and distillate when operating a Magnetically operated reflux divider.

Two independent knobs are provided for time settings of Reflux and Off-take. During 'Off-take' it activates the electro-magnet, which attracts the swinging funnel of reflux divider, and distillation comes out. Both periods can be set accurately within a range of 0-50 seconds.

Timers work on a power supply of 230V, 50Hz.

CAT. REF.	TYPE
SQRT	Non-flameproof
SQRF	Flameproof





COUPLINGS & GASKETS

The couplings designed for use with our glass process plant and pipeline components are of major importance from two main points of view.

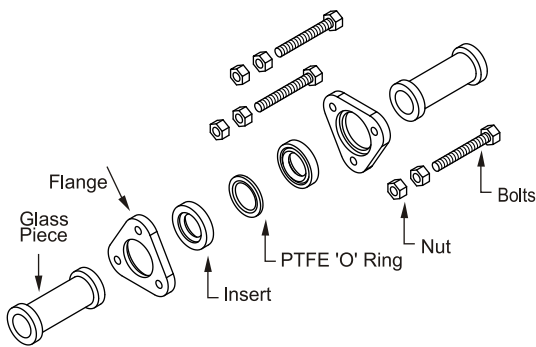
- They must ensure that the bolt load applied to the joint is sufficient to make an effective seal whilst not inducing undue stress in the glass.
- They must be totally reliable in all service conditions.

This chapter of the catalogue covers not only the necessary couplings to join glass equipments and pipeline components together but also the couplings needed to join glass to another materials. For glass plants installed in relatively corrosive environments and added advantage is the availability of couplings constructed from various materials including stainless steel and plastic.

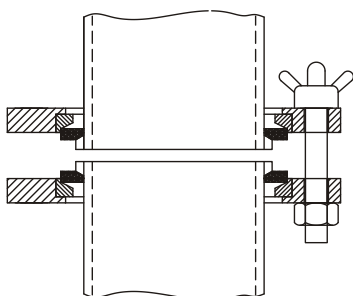
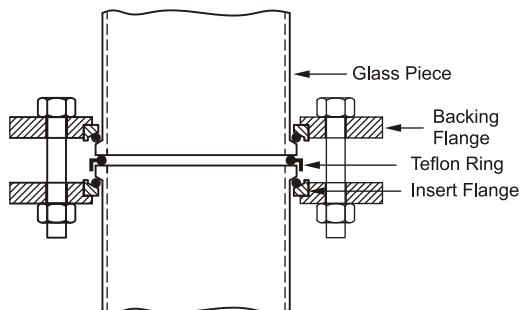
COMPLETE COUPLINGS

Complete coupling consists of two flanges, two inserts and the appropriate number of nuts, bolts, PTFE 'O' ring.

Generally flanges are made of cast iron powder coated / SS, nuts, bolts, springs washers and plain washers can also be supplied SS on request.



ASSEMBLY OF STANDARD FLAT JOINT ENDS



BACKING FLANGES			INSERTS		NUTS & BOLTS			Complete Coupling CAT. REF
DN	CAT. REF	QTY	CAT. REF	QTY	D	L	QTY	
25	SCF1	2	SCN1	2	5/16"	2.5"	3	SCT 1
40	SCF 1.5	2	SCN 1.5	2	5/16"	2.5"	3	SCT 1.5
50	SCF 2	2	SCN 2	2	5/16"	2.5"	3	SCT 2
80	SCF 3	2	SCN 3	2	5/16"	3.5"	6	SCT 3
100	SCF 4	2	SCN 4	2	5/16"	3.5"	6	SCT 4
150	SCF 6	2	SCN 6	2	3/8"	3.5"	6	SCT 6
225	SCF 9	2	SCN 9	2	3/8"	5"	8	SCT 9
300	SCF 12	2	SCN 12	2	3/8"	5"	12	SCT 12
400	SCF 16	2	SCN 16	2	1/2"	8"	12	SCT 16
450	SCF 18	2	SCN 18	2	1/2"	8"	12	SCT 18
600	SCF 24	2	SCN 24	2	1/2"	8"	12	SCT 24

DN is nominal size of coupling.

QUICK RELEASE COUPLINGS

Quick release couplings are used in applications where there is need to open or to close couplings as quickly without using tools. Charging materials to reaction or extraction vessels or replacing measurement indicators are typical examples of this.

Upper flange with slotted bolt-holes, hinged quick release bolts and a lower backing flange, which is fixed on the glass and are separated by means of hinged quick release bolts and wing nuts. Depending upon the frequency of opening. The sealing gasket may need regular renewal.

BACKING FLANGES

Backing flanges form an internal part of the complete coupling detailed earlier in this chapter. Up to and including DN 450 they are one-piece unit and for DN-600 it is available in two pieces. Backing flanges are used to couple to glass end or to a bellow.

Backing flanges are made of cast iron and are used with inserts.

* Stainless steel (S.S.) flanges can be made on request basis.

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

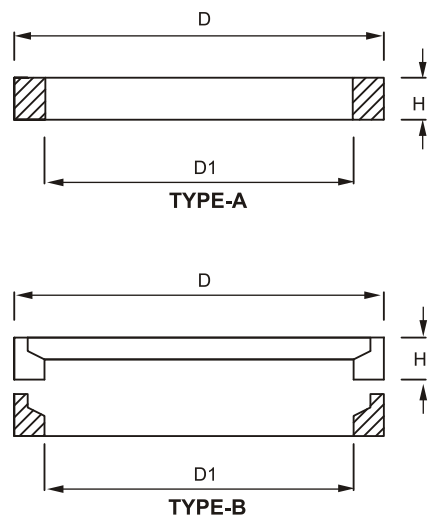
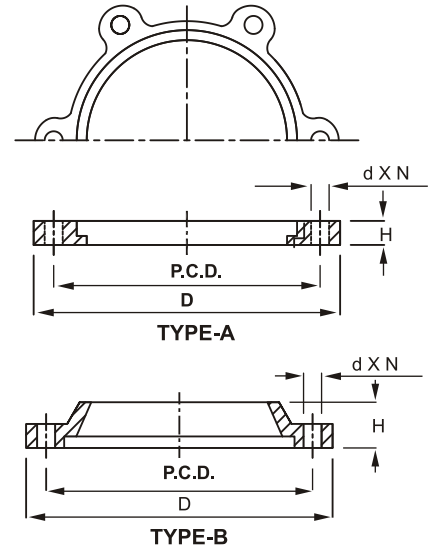
Note : H may vary ± 2 mm up to DN 150 and ± 3 mm from Dn 200 to Dn 600mm
DN is the nominal size of the coupling.

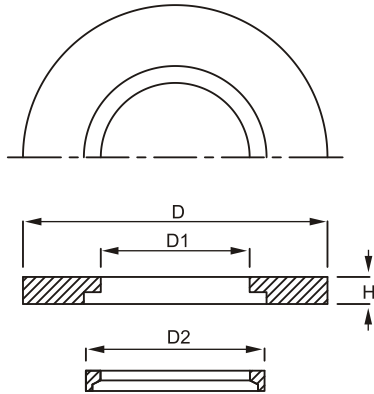
INSERTS

Spilt ring type insert are used with backing flanges. This are made of cast iron asbestos rope. Non asbestos PTFE impregnated rope cab be supplied on request. Insert from rubber material can also be supplied on request.

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

Note : H may vary ± 2 mm up to DN 150 and ± 3 mm from Dn 200 to Dn 600mm
DN is the nominal size of the coupling.





ADAPTOR BACKING FLANGE

These flanges are made of cast iron and are supplied with a split ring.

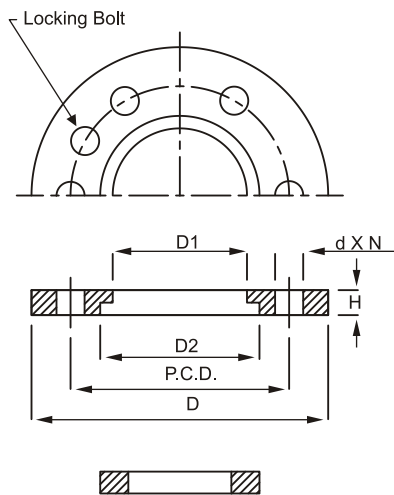
Aluminum flanges can also be supplied on request. Please mention Cat.Ref. SCFA for cast iron and SACFA for aluminum flanges.

Adaptor backing flanges are generally supplied undrilled. However, if specified, these can be supplied drilled as per "Table E", "Table F" and "ASA 150" standards.

UNDRILLING FLANGES

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

Drilled to Table E			Drilled to Table F			Drilled to ASA 150		
CAT. REF.	PCD	n x dØ	CAT. REF.	PCD	n x dØ	CAT. REF.	PCD	n x dØ
SCFA 1/E	82	4 x 12Ø	SCFA 1/F	87	4 x 16Ø	SCFA 1/A	79	4 x 12Ø
SCFA 1.5/E	98	4 x 12Ø	SCFA 1.5/F105	105	4 x 16Ø	SCFA 1.5/A	98	4 x 12Ø
SCFA 2/E	114	4 x 16Ø	SCFA 2/F	127	4 x 16Ø	SCFA 2/A	121	4 x 16Ø
SCFA 3/E	146	4 x 16Ø	SCFA 3/F	165	8 x 16Ø	SCFA 3/A	152	4 x 16Ø
SCFA 4/E	178	8 x 16Ø	SCFA 4/F	190	8 x 16Ø	SCFA 4/A	190	8 x 16Ø
SCFA 6/E	235	8 x 19Ø	SCFA 6/F	260	12 x 19Ø	SCFA 6/A	241	8 x 19Ø
SCFA 9/E	324	12 x 19Ø	SCFA 9/F	356	12 x 23Ø	SCFA 9/A	298	8 x 19Ø
SCFA 12/E	406	12 x 23Ø	SCFA 12/F	438	16 x 23Ø	SCFA 12/A	432	12 x 23Ø



BELLOW FLANGES

These flanges are made of cast iron and supplied with a split ring.

Aluminum flanges can also be supplied on request. Please mention Cat.Ref. SBF for cast iron and SABF for aluminum flanges.

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

ADAPTOR BELLOW FLANGES

These flanges are made of cast iron and supplied with a split ring.

Aluminum flanges can also be supplied on request. Please mention Cat. Ref. SBFA for cast iron and SABFA for aluminum flanges.

Adaptor bellow flanges are generally supplied undrilled. However, if specified, these can be supplied drilled as per "Table E", "Table F" and "ASA 150" standards.

UNDRILLING FLANGES

DN	D	D1	D2	H	CAT. REF
25	115	44	53	7	SBFA 1
40	150	59	65	9	SBFA 1.5
50	165	70	81	8	SBFA 2
80	200	104	115	9	SBFA 3
100	220	133	149	9	SBFA 4
150	285	189	204	11	SBFA 6
225	395	261	280	12	SBFA 9
300	445	342	363	12	SABFA12

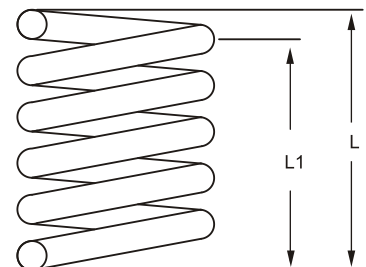
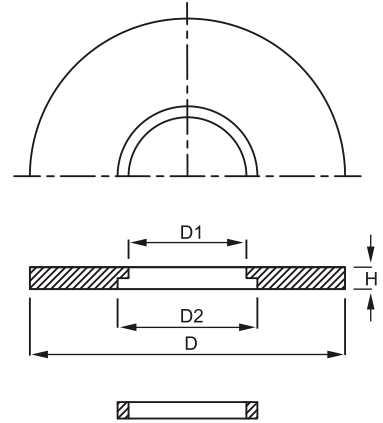
Drilled to Table E			Drilled to Table F			Drilled to ASA 150		
CAT. REF.	PCD	n x dØ	CAT. REF.	PCD	n x dØ	CAT. REF.	PCD	n x dØ
SBFA 1/E	82	4 x 12Ø	SBFA 1/F	87	4 x 16Ø	SBFA 1/A	79	4 x 12Ø
SBFA 1.5/E	98	4 x 12Ø	SBFA 1.5/F	105	4 x 16Ø	SBFA 1.5/A	98	4 x 12Ø
SBFA 2/E	114	4 x 16Ø	SBFA 2/F	127	4x 16Ø	SBFA 2/A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

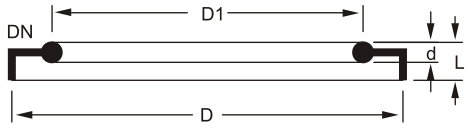
COMPRESSION SPRINGS

Compression rings are used to set and maintain the correct bolts load on standard glass couplings.

Standard compression springs have a corrosion resistant coating and are also available in SS.

DN	FREE L	INSTALLED L1	CAT. REF.
25 -100	14.5	11.0	SDF 8.5
150 - 300	22.0	18.0	SDF 10.5
450 - 600	28.7	22.7	SDF 13

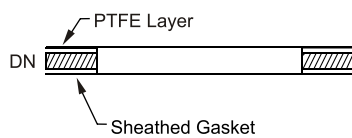
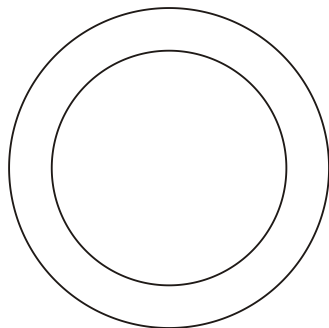




PTFE 'O' RINGS

PTFE 'O' rings are the most widely used gaskets in glass fittings. These are provided with a locking collar, which help to lock the two glass surface correctly. They are manufactured from quality grade of PTFE.

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



PTFE SHEATHED GASKETS

These gaskets take form of a PTFE sheath fitted over a compressed asbestos fiber gaskets. When using this type of gasket, a higher bolting force is required for DN 450 and above.

Please consult our Technical Department for further information.

DN	CAT . REF.
25	STMP 1
40	STMP 1.5
50	STMP 2
80	STMP 3
100	STMP 4
150	STMP 6
225	STMP 9
300	STMP 12
450	STMP 18
600	STMP 24

PTFE BELLOWS

PTFE bellows are an important aid in the construction of glass plant and pipeline.

They can be used to compensate for different thermal movement between glass and associated equipment, absorb vibrations from associated equipment or foundations. In particular, bellows can be used for connecting glass to other materials. When bellows are used, the support and restraint of the glass should be such that the force resulting from pressure/vacuum in the pipeline and forces resulting from movement of the bellows do not result in undue stresses in the glass. The maximum operating temperature for PTFE bellows is 180°C. Bellows DN 80 and above should not be used under vacuum. For such application we recommend the use of vacuum bellows as detailed on the following page.

Permissible operating conditions for SBFN bellows

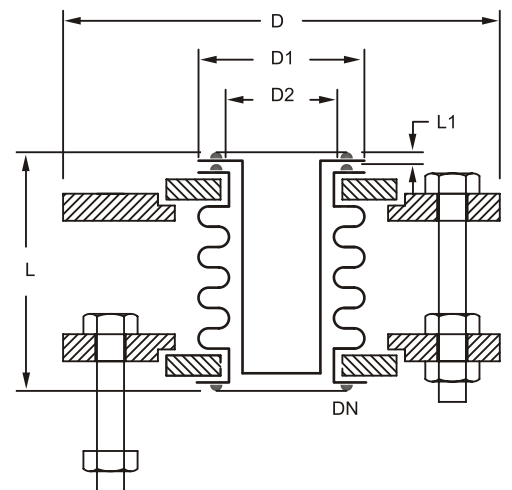
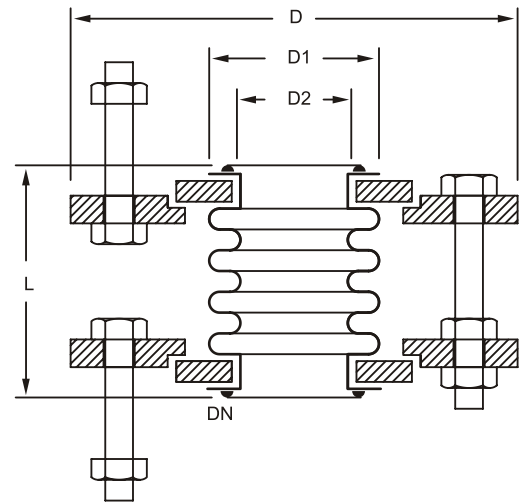
Permissible operating pressure (bar g)

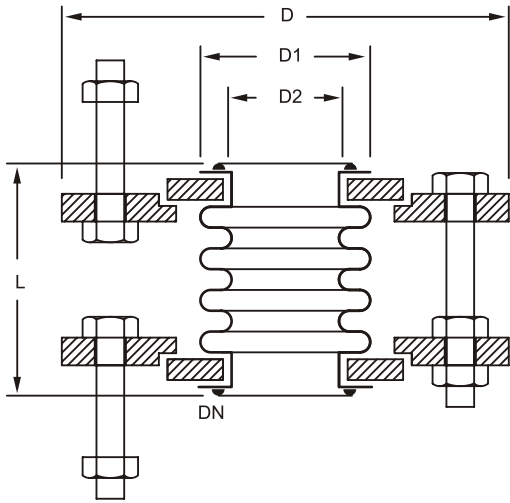
DN	20°C	100°C	160°C	200°C
15	-1/+4	-1/+3	-1/+ 1,5	
25	-1/+4	-1/+3	-1/+ 1,5	
40	-1/+4	-1/+3	-1/+ 1,5	
50	-1/+4	-1/+2	-1/+1	unpressurised
80	-1/+3	-1/+2	-1/+1	
100	-1/+2	-1/+2	-1/+1	
150	-1/+2	-1/+ 1,5	-1/+ 0,7	
200	-1/+1	-1/+1	-1/+ 0,5	
300	-1/+1	-1/+ 0,7	-1/+ 0,3	

Permissible operating conditions for SVBN bellows

Permissible operating pressure (bar g)

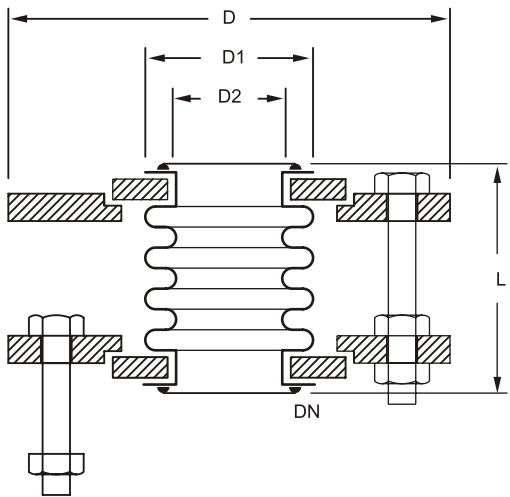
DN	20°C	100°C	160°C	200°C
80	-1/+3	-1/+2	-1/+1	
100	-1/+2	-1/+2	-1/+1	
150	-1/+2	-1/+ 1,5	-1/+ 0,7	unpressurised
200	-1/+1	-1/+1	-1/+ 0,5	
300	-1/+1	-1/+ 0,7	-1/+ 0,3	





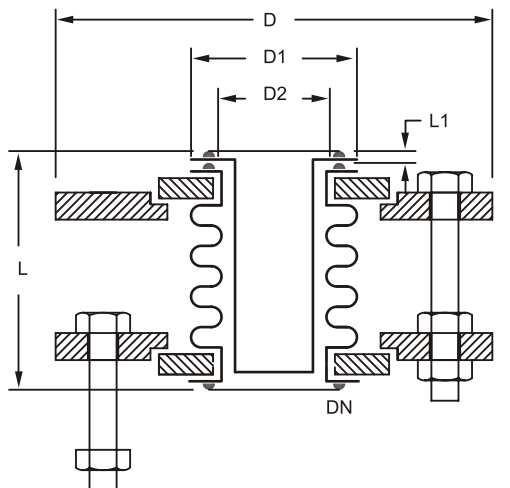
**PTFE BELLOWS
GLASS TO GLASS (LINE BELLOW)**

DN	D	D1	D2	L	CAT. REF
25	90	41	31	60	SFBN1
40	105	56	43	60	SFBN1.5
50	121	69	55	60	SFBN2
80	155	98	82	65	SFBN3
100	200	132	111	65	SFBN4
150	274	184	162	65	SFBN6
225	340	258	230	65	SFBN9
300	425	340	308	65	SFBN12



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

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



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

DN	D	D1	D2	L	L1	Cat. Ref
80	155	98	82	70	5	SVBN 3
100	200	132	111	70	5	SVBN 4
150	275	184	162	70	5	SVBN 6
225	350	258	230	70	5	SVBN 9
300	425	340	308	70	5	SVBN 12

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

DN	D	D1	D2	L	L1	CAT. REF
80	155	98	82	70	5	SVBF 3
100	200	132	111	70	5	SVBF 4
150	275	184	162	70	5	SVBF 6
225	350	258	230	70	5	SVBF 9
300	425	340	308	70	5	SVBF 12

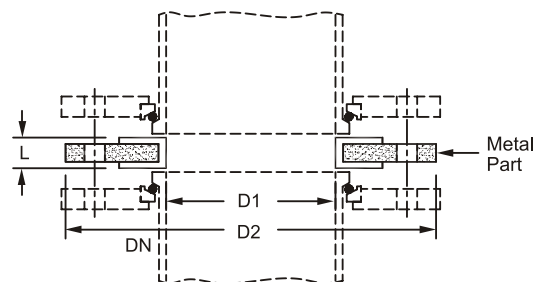
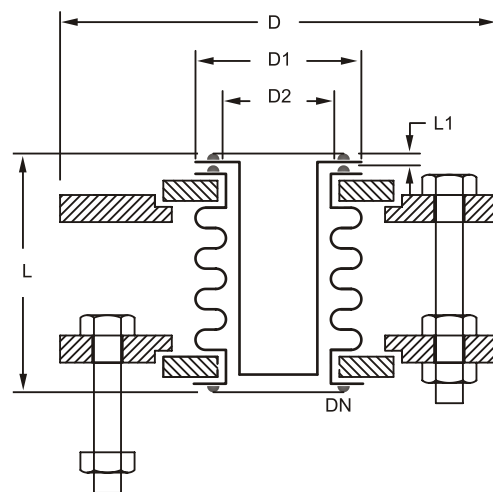
* Bellows can be supplied with undrilled adaptor flanges. However, if specified, these can be supplied drilled as per "Table E", "Table F" and "ASA 150" standards.

* Tolerances for above bellows in length is $\pm 3\text{mm}$ and diameter as per glass buttress end tolerance as given in Technical Information.

ADAPTOR PLATE FOR REACTORS

These components are used as interface spacers when connecting glass flat buttress end components to other process plant and pipeline equipment and glass-lined reaction vessels. A combination of steel, rubber and PTFE provide an ideal sealing surface with only PTFE coming into contact with the process fluids to maintain resistance to corrosion.

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





TUBULAR SUPPORTING STRUCTURE

Glass plant and equipments are supported in a rectangular tubular structure.

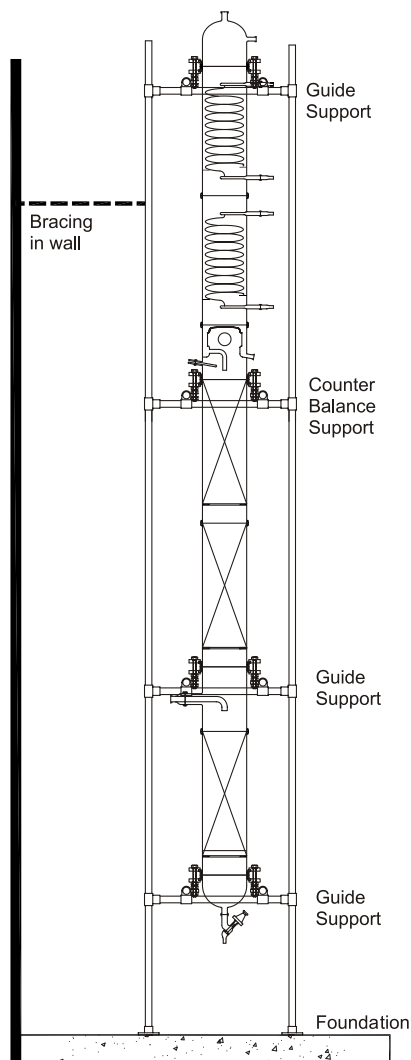
This tubular structure consisting of galvanized mild steel tubing with cast iron fitting, which are described in this catalogue. This type of structure provides enough flexibility for future modifications and is strong enough to support a glass plant.

S.S Tubing and / or powder coated structure parts can also be supplied on request .

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
3/4"	19	21.5
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.
- The whole weight of a column must be taken up from the fixed point. This normally presents no problem up to DN 300, but with larger columns it may be necessary to take up some of the weight by means of counterbalance supports.

STRUCTURES FITTINGS

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

- These sliding are provided with grub screws to fix it at required position on at galvanized tube.
- These fittings are specially made to construct a tubular structure, which provides enough flexibility for future modification without involving any hammering and welding.

TEE	NB	CAT. REF.
	25	ST 25
	30	ST 30
	40	ST 40
	50	ST 50

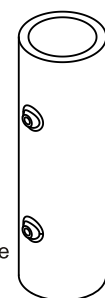
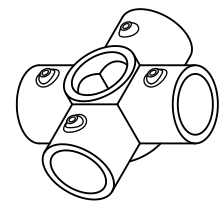
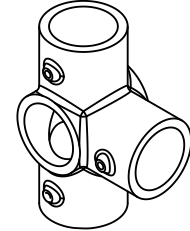
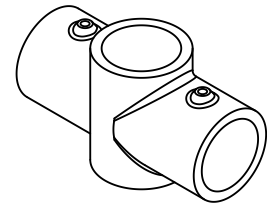
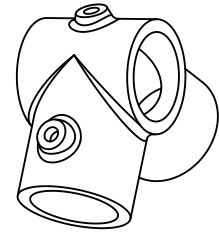
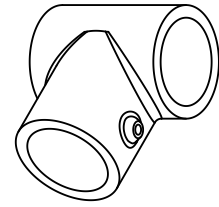
BEND	NB	CAT. REF.
	25	SBN 25
	30	SBN 30
	40	SBN 40
	50	SBN 50

DOUBLE TEE	NB	CAT. REF.
	25	SDT 25
	30	SDT 30
	40	SDT 40
	50	SDT 50

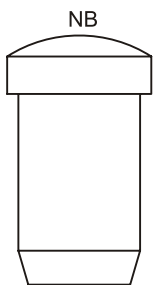
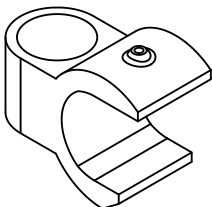
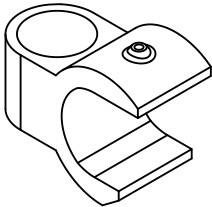
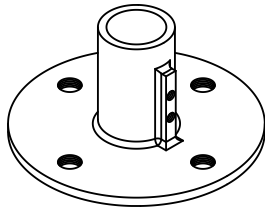
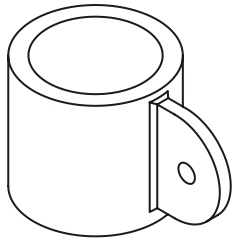
DOUBLE BEND	NB	CAT. REF.
	25	SDB 25
	30	SDB 30
	40	SDB 40
	50	SDB 50

CROSS	NB	CAT. REF.
	25	SX 25
	30	SX 30
	40	SX 40
	50	SX 50

COUPLER	NB	CAT. REF.
	25	SCL 25
	30	SCL 30
	40	SCL 40
	50	SCL 50



These are used to couple the vertical tubes where more length is required



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



SUPPORT	NB	CAT. REF.
	15	SSPT 15
	25	SSPT 25
	30	SSPT 30
	40	SSPT 40
	50	SSPT 50

BASE	NB	CAT. REF.
	25	SBS 25
	30	SBS 30
	40	SBS 40
	50	SBS 50

EQUAL BRACKET	NB	CAT. REF.
	25	SEBT 25
	30	SEBT 30
	40	SEBT 40
	50	SEBT 50

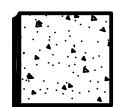
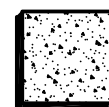
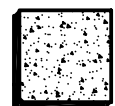
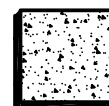
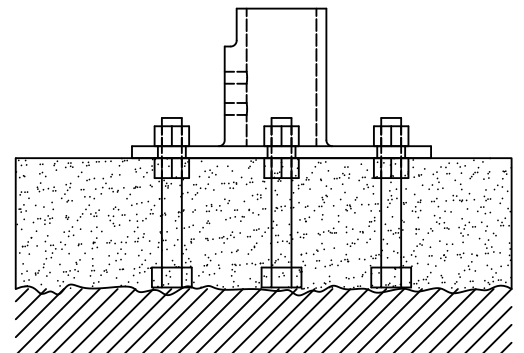
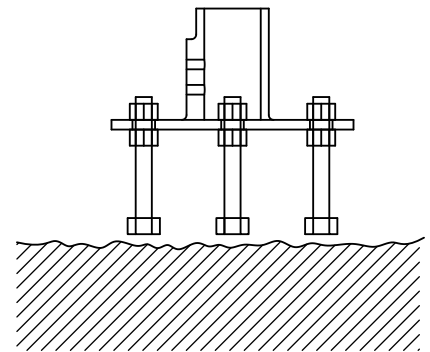
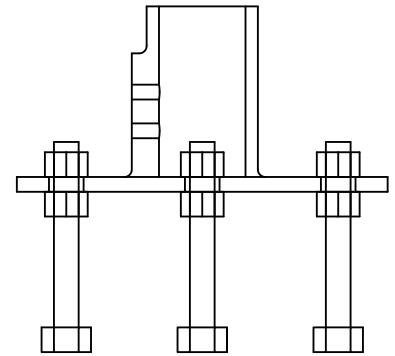
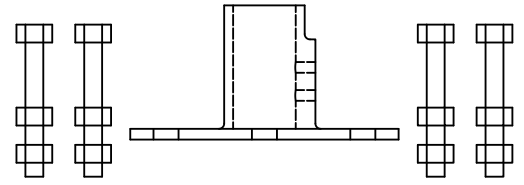
UNEQUAL BRACKET	NB	CAT. REF.
	25	SUBT 25/15
	30	SUBT 30/25
	40	SUBT 40/25
	50	SUBT 50/25

PLUGS	NB	CAT. REF.
	25	SPL 25
	30	SPL 30
	40	SPL 40
	50	SPL 50

STUDS	D	CAT. REF.
	5/16"	SST 5/16
	3/8"	SST 3/8
	1/2"	SST 1/2

GROUTING OF BASE

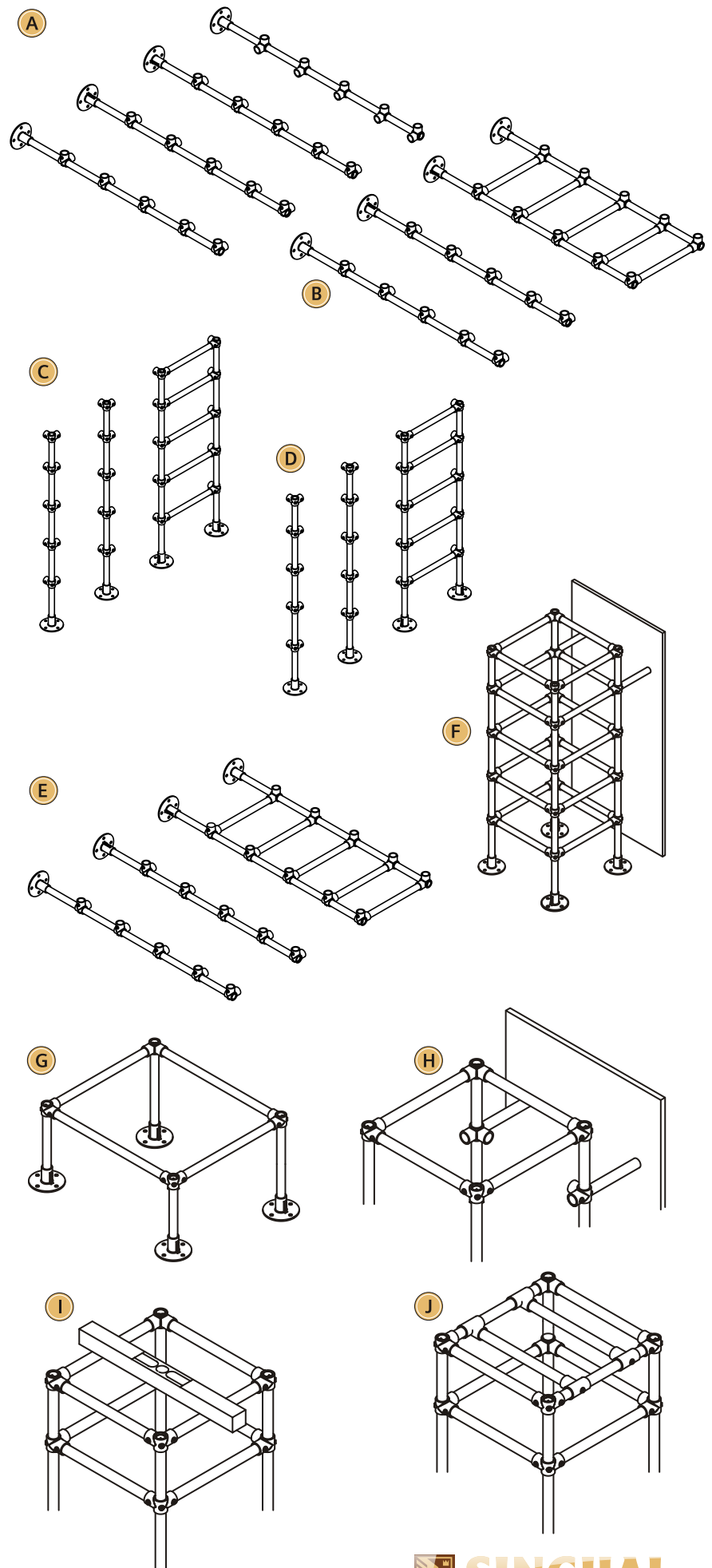
- 1 Take one cast iron base and four foundation bolts, each with 2 nuts.
- 2 Fit the bolts in base so that base raised up to 150 mm from head of bolts.
- 3 Put this assembly on the floor and prepare a rough surface for proper bonding of grouting.
- 4 Make a concrete block over the bolts of about 200 x 200 mm up to 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 STRUCTURE ASSEMBLING

Structures are designed to support plant and other equipment comprising components exclusively or principally in borosilicate glass 3.3 Because of the special requirements resulting from the use of this material. Mostly these structures consist of steel/galvanized tubing in four different diameters, which are connected using the suitable fittings. As a result, the structures cannot only be dismantled and reassembled whenever required but they can also be modified and added to quite easily.

- A. Side the fittings on to the tubes in correct sequence and lightly tighten in approximate position.
- B. Assemble one side frame of the structure by adding the cross tubes between two vertical tubes.
- C. Assemble one side frame of the structure by adding the cross tubes between other two vertical tubes.
- D. Build up the cross tubes to form the ends of the structure.
- E. Add the remaining vertical tubes and cross tubes to complete the structure and tighten all the fittings.
- F. Hoist the structure and brace it to some existing rigid feature.
- G. Grout the foundation bolt and fix the structure bases with that.
- H. Adjust bracing to obtain a correct plum in structure.
- I. Adjust the horizontal frames in correct level.
- J. Assemble the support tubes at their positions.





PACKAGE UNITS

Package Units/ Assemblies are multi-purpose units having flexibility of utility. These units have been standardised by incorporating all basic & essential features such as heating, stirring, condensation, fractionation, cooling etc. for multipurpose use. Therefore, though termed " Package Units" from constructional viewpoint they actually serve as "Flexi Units" from utility point of view. These units find use in educational institutions, R&D centers and industries. They can be conveniently and quickly modified according to specific process needs due to modular construction, Borosilicate glass offers additional benefits of universal corrosion resistance, visibility and cleanliness.

SIMPLE DISTILLATION UNITS

It consists of a vessel mounted in a heating bath and fitted with a condenser for condensing the fumes. receiver with drain valve can be added for receiving the condensate. The units are available in vessel sizes of 20, 50, 100, 200 & 300 Ltr. and is suitable for operation under atmospheric pressure and full vacuum.

Reactor Capacity	Bath KW	Vapour Line	Condenser M ²	Cat. Ref.
10 L	2	50 DN	0.2	SSDU 10
20 L	3	80 DN	0.35	SSDU 20
50 L	4.5	100 DN	0.5	SSDU 50
100 L	6	150 DN	1.5	SSDU 100
200 L	9	150 DN	1.5	SSDU 200
300 L	10.5	225 DN	2.5	SSDU 300

REACTION UNIT

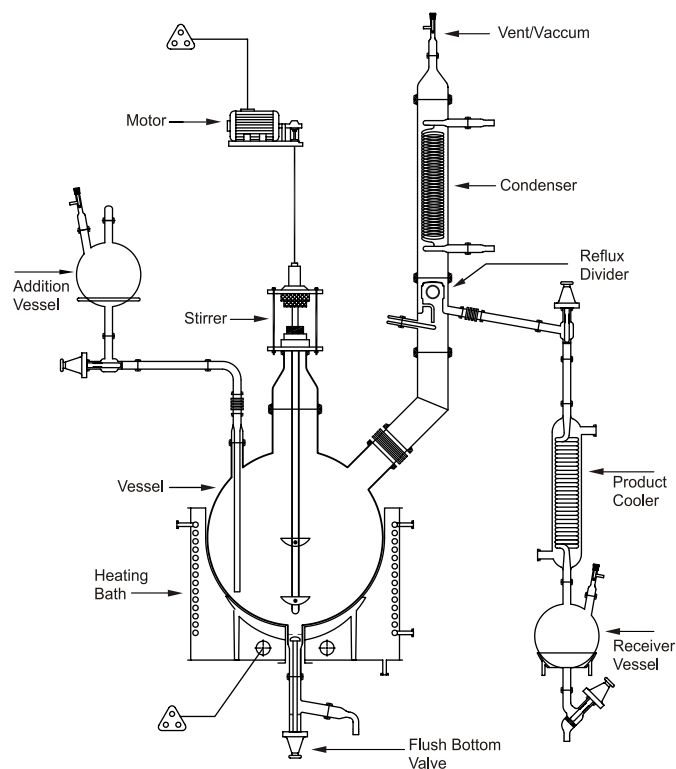
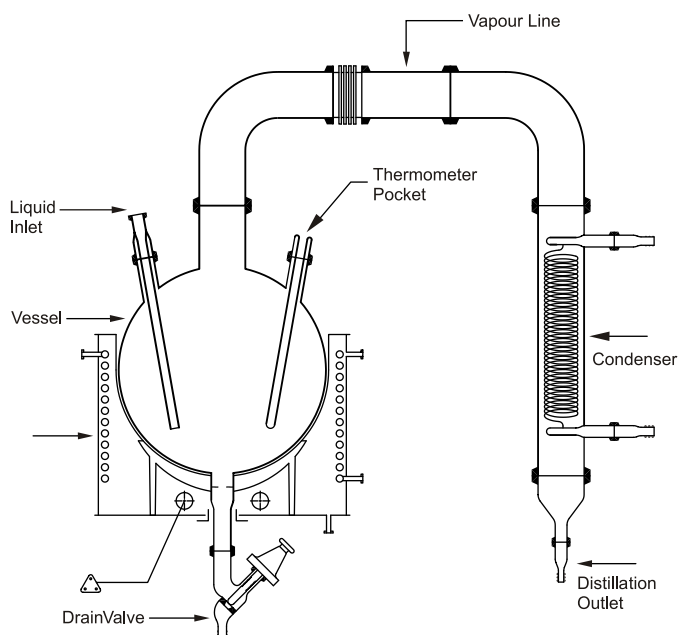
This unit is used for carrying out reactions under stirred condition and with provision for simple reflux distillation.

The reaction vessel is mounted in a heating bath and fitted with addition vessel, motor-driven stirrer and provision for condensation with refluxing. The product is sub-cooled and collected in a receiver.

The units are available in vessel sizes of 20, 50, 100 & 200 & 300Ltr and is suitable for operation under atmospheric pressure and full vacuum.

Reactor Capacity	Bath KW	Addition Vessel	Vapour Line	Condenser HTA M ²	Cooler HTA M ²	Receiver Size	Cat. Ref.
10L	2	2	50 DN	0.2	0.1	2L	SRDU 10
20 L	3	2 L	80 DN	0.35	0.1	5L	SRDU 20
50 L	4.5	5 L	100 DN	0.5	0.2	10L	SRDU 50
100 L	6	10 L	150 DN	1.5	0.35	20L	SRDU 100
200 L	9	20 L	150 DN	1.5	0.35	20L	SRDU 200
300 L	10.5	20 L	225 DN	2.5	0.5	20L	SRDU 300

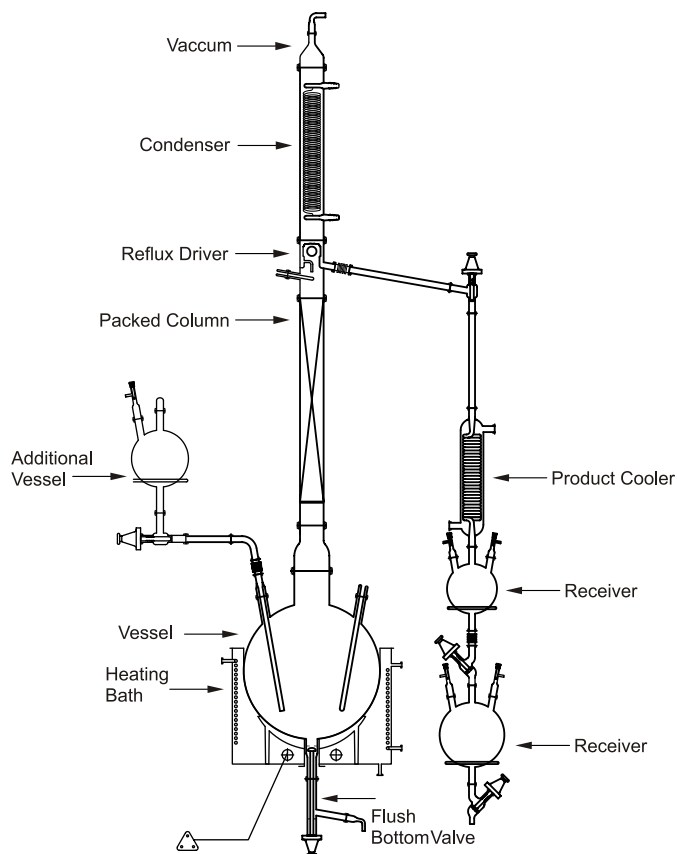
*These units are available in cylindrical vessel also.



FRACTIONAL DISTILLATION UNIT

This is essentially a compact batch-type fractional distillation unit in which the reboiler consists of a vessel mounted in a heating bath and with a packed column above. The vapours from top is condensed and can be refluxed as per requirement. The top product is sub-cooled and collected in receivers. The bottom product is finally drained from the reboiler through a drain valve. The units are available in vessel sizes of 20, 50, 100 & 200L, and 300Ltr. is suitable for operation under atmospheric pressure and full vacuum.

Reactor Capacity	Bath KW	Addition Vessel	Vapour Line	Condenser HTA	Cooler M ²	Receiver Size	Cat. Ref.
10 L	2	2 L	50 DN	0.2	0.1	2L, 2L	SFDU 10
20 L	4	2 L	80 DN	0.35	0.1	2L, 5L	SFDU 20
50 L	4.5	5 L	100 DN	0.5	0.2	5L, 10	SFDU 50
100 L	6	10 L	150 DN	1.5	0.35	10L, 20L	SFDU 100
200 L	9	20 L	150 DN	1.5	0.35	10L, 20L	SFDU 200
300 L	10.5	20 L	225 DN	2.5	0.5	20L, 20L	SFDU 300

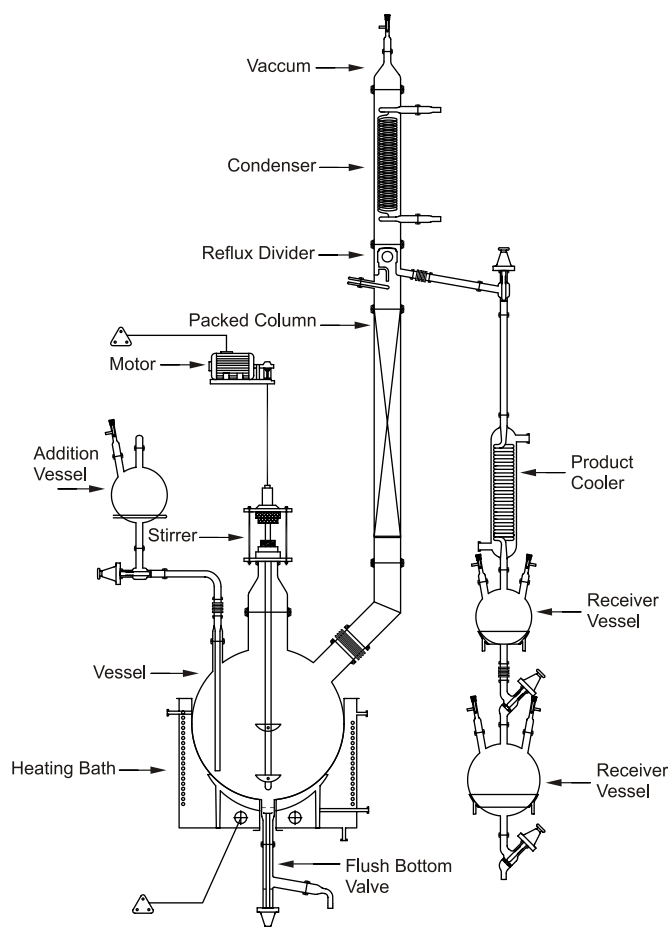


REFLUX REACTION CUM DISTILLATION UNIT

This is a versatile unit and can be used as Reaction Distillation Unit, Fractional Distillation Unit or a combination of both. All features of Reaction Distillation Unit and Fractional Distillation Unit are incorporated.

The units are available in vessel sizes of 20, 50, 100 & 200L, and 300Ltr. is suitable for operation under atmospheric pressure and full vacuum.

Reactor Capacity	Bath KW	Addition Vessel	Vapour Line	Condenser HTA	Cooler M ²	Receiver Size	Cat. Ref.
10 L	2	2 L	50 DN	0.2	0.1	2 L, 2L	SFRU 10
20 L	3	2 L	80 DN	0.35	0.1	2L, 5L	SFRU 20
50 L	4.5	5 L	100 DN	0.5	0.2	5L, 10L	SFRU 50
100 L	6	10 L	150 DN	1.5	0.35	10L, 20L	SFRU 100
200 L	9	20 L	150 DN	1.5	0.35	10L, 20L	SFRU 200
300 L	10.5	20 L	225 DN	2.5	0.5	20L, 20L	SFRU 300



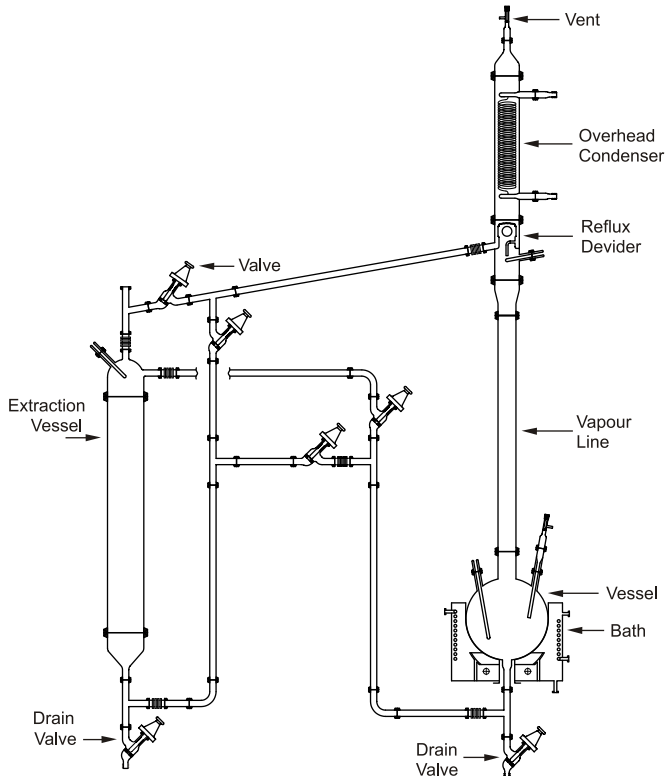
LIQUID-LIQUID EXTRACTION UNIT

Liquid extraction, sometimes called solvent extraction, is the separation of constituents of a liquid solution by contact with another insoluble liquid. The unit described here is for a semi-batch operation.

The liquid to be extracted is poured into an extraction vessel. Solvent is boiled in a reboiler vessel and condensed in an overhead condenser, the condensed liquid collecting in a reflux divider and passing through pipework to the extraction vessel. The pipework incorporates valves in order that the solvent can enter the extraction vessel at either the base or the top, depending on the relative densities of the solvent and liquid to be extracted. The solvent and the extracted liquid pass back to the reboiler and the process is repeated until the extraction is complete. The extraction vessel is then drained and the solvent evaporated from the reboiler vessel and collected in the extraction vessel enabling the two liquids to be drained from their respective vessels.

The units are available in vessel sizes of 10, 20, & 50Ltr. and is suitable for operation under atmospheric pressure.

Reactor Capacity	Bath KW	Vapour Line	Extraction Vessel	Condenser M ²	Cat. Ref.
10 L	2	40mmx1m	10 L	0.35	S-LLU 10
20 L	3	50mmx1m	20 L	0.5	S-LLU 20
50 L	4.5	80mmx1m	50 L	1.5	S-LLU 50



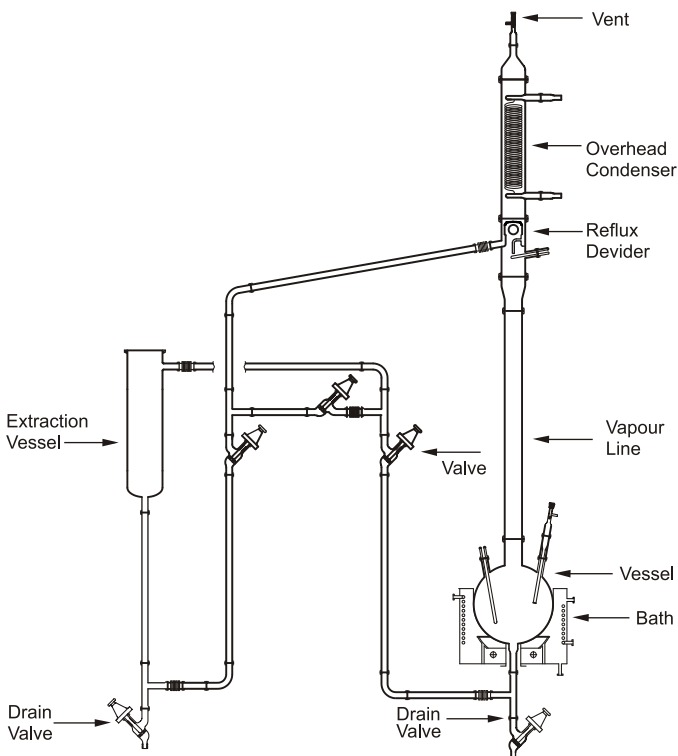
SOLID LIQUID EXTRACTION UNIT

This operation involves preferential solubilising of one or more soluble constituents (solutes) of a solid mixture by a liquid solvent. The unit described here is for a semi-batch operation.

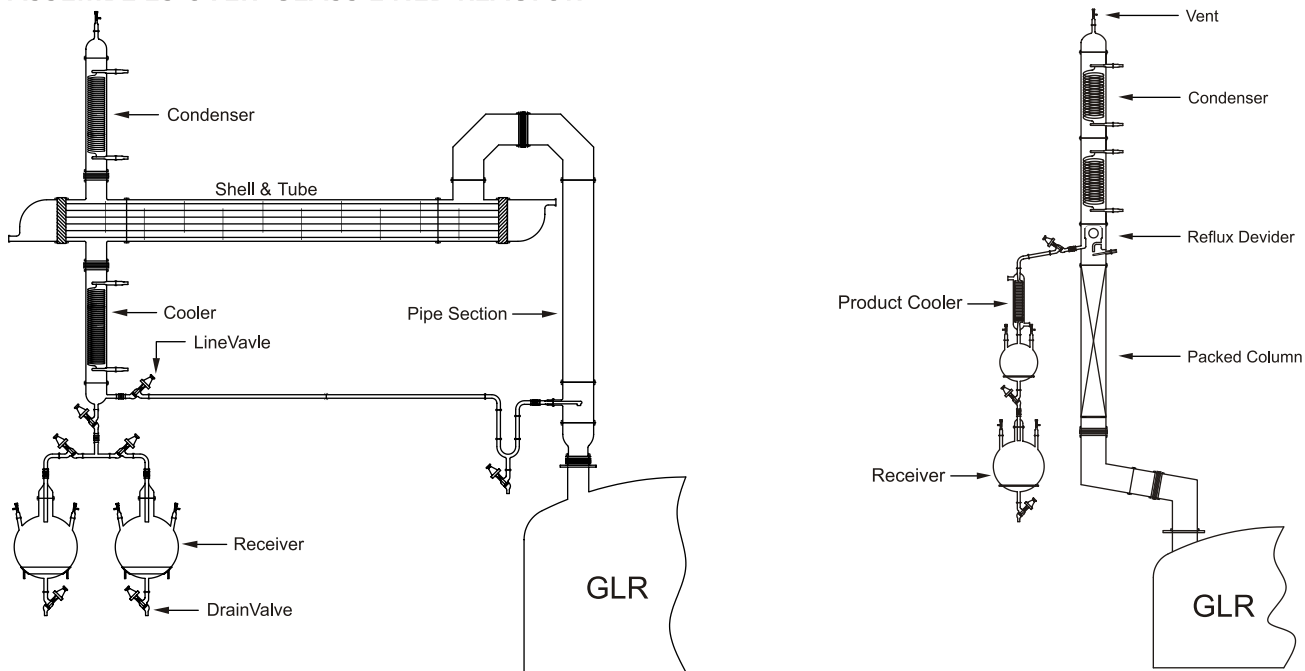
The solid to be extracted is put inside a glass fiber bag and placed in an extraction vessel. Solvent from the reboiler is continuously evaporated, condensed and circulated through a reflux divider by means of piping network and valves. When desired/ steady concentration of solute is achieved in the solution the operation is discontinued. The solution is drained off and collected for further use.

After charging fresh solid in fiber bag and solvent in reboiler, the cycle can be restarted again. The units are available in vessel sizes of 10, 20, & 50Ltr. and is suitable for operation under atmospheric pressure.

Reactor Capacity	Bath KW	Vapour Line	Extraction Vessel	Condenser M ²	Cat. Ref.
10 L	2	40mmx1m	10 L	0.35	S-SLU10
20 L	3	50mmx1m	20 L	0.5	S-SLU20
50 L	4.5	80mmx1m	50 L	1.5	S-SLU50



ASSEMBLIES OVER GLASS LINED REACTOR



Glass Lined Reactors are used instead of glass reactors specially when scale of operation is large and relatively high pressure steam is to be used as heating media. Quite often assemblies like Simple Distillation Unit, Reaction Distillation Unit, Fractional Distillation Unit etc. are installed above glass lined reactors. The basic features of these assemblies remain the same but glass shell and tube heat exchanger is preferred due to large scale of operation. A typical fractional distillation unit type assembly over GLR is shown in adjacent figure.

The Assemblies can be separated into different categories.

MIXING REACTOR

Mixing reactor systems represent a long-term evaluation of equipment and customer requirements. The mixing reactors are preferably used for wide applications in laboratory, pilot plant & for small-scale production. They reduce the need for investment in permanent installations & also reduce the pressure & temperature losses resulting from pipeline installation.

These reactors are available with spherical shape & in cylindrical shape. These reactors are also available in cylindrical jacketed form.

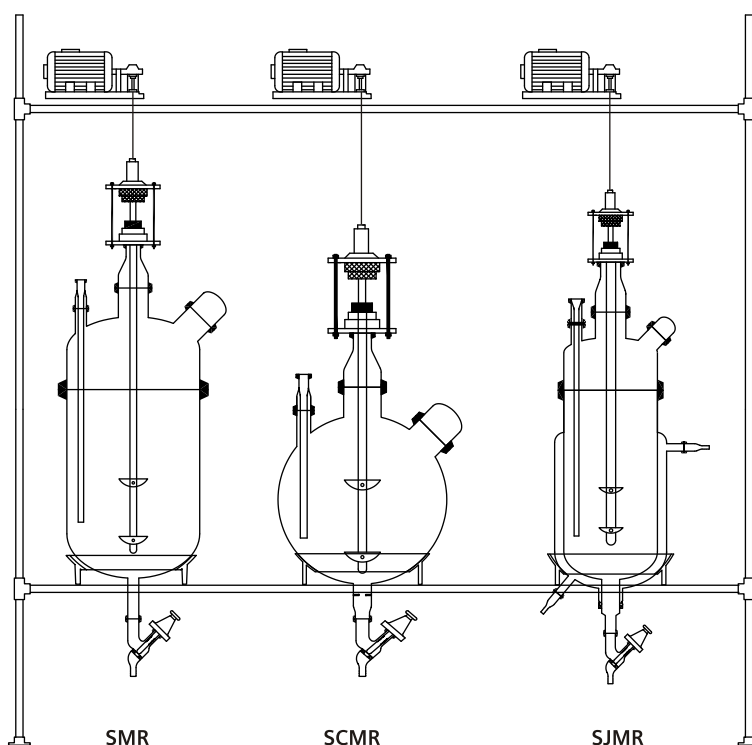
SPHERICAL & CYLINDRICAL MIXING REACTOR

Capacity	Cylindrical Cat .Ref.	Spherical Cat. Ref.
20 L	SMR 20	SCMR 20
50 L	SMR 50	SCMR 50
100 L	SMR 100	SCMR 100
200 L	SMR 200	SCMR 200
300 L	SMR 300	SCMR 300

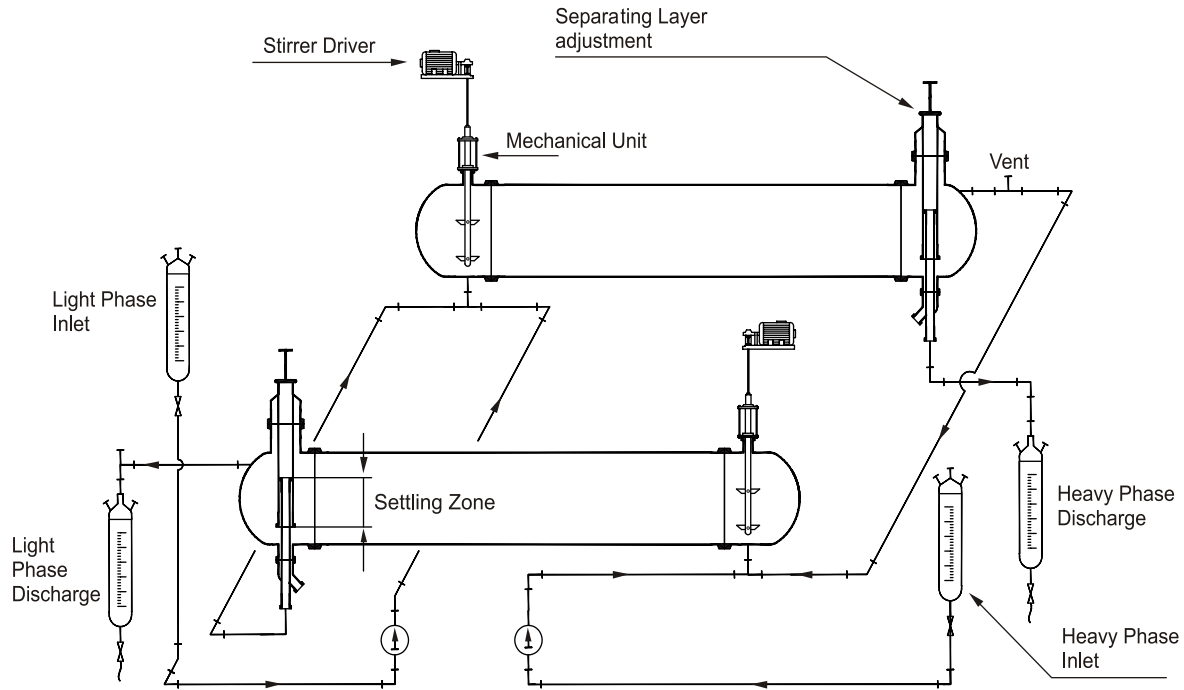
Reactor Capacity	Jaketed Mixing Reactor Cat. Ref.
5 L	SJMR 5
10 L	SJMR 10
20 L	SJMR 20
30 L	SJMR 30
50 L	SJMR 50
100 L	SJMR 100

Material of construction

1. Stirrer Drive, non-flameproof or flameproof Motor, 192 RPM.
2. Stirrer material of construction glass or PTFE Lined.
3. Stirrer shape glass impeller stirrer with PTFE blades, vortex stirrer, propeller stirrer & anchor stirrer.
4. Stirring assembly with bellow seal or with mechanical seal.
5. Supporting structure carbon steel, epoxy coated carbon steel, stainless steel 304 & stainless steel 316. All structures are available in trolley-mounted form.
6. Closing valve drain valve or flush bottom outlet valve.



MIXER SETTLER



The MIXER -SETTLER is a revolutionary new device, which makes phase separation automatic and simple, irrespective of the concentration of two phases (interface height). The mixer settler is the name given to a type of EXTRACTOR made up of a number of mixing and settling chambers connected alternately in series. In the mixing chambers optimum mass transfer is achieved by through mixing of two phases with the aid of pumps and stirrers. In the simplest case, the MIXER -SETTLER consist of adjustable overflow valve, stirrer drive assembly and settling zone.

The MIXER SETTLER has a wide application in the chemical process industry , particularly in :

- Azeotropic Distillation
- Extractive Distillation
- Steam Distillation
- Esterification Reaction
- And other process, calling for separation and recycle of two immiscible liquid phase.

Over View of The System

The system consists of the following adjustable overflow valve, stirrer drive assembly and settling zone.

Construction

Stirrer Drive Assembly

The mixing chamber consists of a cylindrical glass cover in which a variable speed stirrer drive is fitted. Glass impeller Stirrer creates a negative pressure at the inlet, which can be used to draw liquid from a previous stage in the process. In the mixing zone a turbine stirrer with variable speed unit mixes the two phases and the mass transfer takes place during dispersion.

Separation Zone

Separation of phases takes place in two phases. Firstly, The turbulent

flow in the mixing zone must be brought under control and converted in to axial flow. Then the mixer passes into the separation zone where the two phases separate, due to their specific gravity difference.

Auto Continuous Separation

The adjustable overflow valve assembly at one end of the vessel can be set for any interface height. The position of the overflow weir is adjusted to suit the relative densities of the two phases. This valve can be operated externally such that the interface height can be set or reset depending on the operating process conditions. The separating head incorporates an internal overflow weir, which is manually adjusted using a hand wheel. The internals are arranged in such a way that the heavy phase flows up through the annular space between the dip pipe and the over flow weir and then overflows through holes in the overflow pipe and out through the outlet pipe.

Visual Monitoring

The transparency of Borosilicate glass facilitates the adjustment of the overflow valve by visual monitoring where by any change in the process conditions resulting into a change in layer (interface) height can be immediately adjusted by resetting the overflow valve. The resetting of the separation height is very simply achieved by rotating the hand wheel of the overflow valve assembly in the clock or anti clock direction.

Large Interface Plane Area

The horizontal glass vessel of the MIXER -SETTLER provides a large interface area of separation two immiscible liquid phases for a given volume. This enhances the efficiency of the separation process.

Non Corrosive

Being Borosilicate glass, the corrosion and temperature resistance of the material of construction is unmatched by any other alternate which is transparent too.

HCL GAS GENERATION

(Azeotropic Boiling Route)

Commercial hydrochloric acid is available in the market as 30% aqueous solution and is widely used in industry in large quantities. But for certain applications e.g. in bulk drug/pharmaceutical industry HCl gas is required in gaseous form. Such users generate anhydrous HCl from commercial grade for their captive consumption. Several methods have been adopted and generation through BOILING ROUTE is also a reliable technique.

Salient features

1. Operational reliability
2. Available in wide range capacities - from 10kg to 200kg/hr of dry HCl.
3. Except commercial hydrochloric acid, no other raw-material is required.
4. The spent acid about 21% HCl usually finds use for captive consumption.
5. Capable of operating from 25-100%.
6. Ease of installation.
7. Negligible pressure drop.

Raw Material & Utility Requirements

The indicative requirements for 20kg/hr HCl gas generator are given below :

1. 30-32% HCl, (kg/hr) : 250
2. Cooling water at 30° C (M³/hr) : 3.5
3. Chilled brine at -10° C (M³/hr) : 4
4. Saturated Steam at 2.5 Kgs/cm² - g (Kgs.) : 50

HCl GAS GENERATOR (Sulphuric Acid Route)

Commercial hydrochloric acid is available in the market as 30% aqueous solution and is widely used in industry in large quantities. But for certain applications e.g. in bulk drug/pharmaceutical industry HCl gas is required in anhydrous state for critical reactions where moisture cannot be tolerated. Such users generate anhydrous HCl from commercial grade for their captive consumption. Several methods have been adopted but generation through SULPHURIC ACID ROUTE is the most reliable and handy technique.

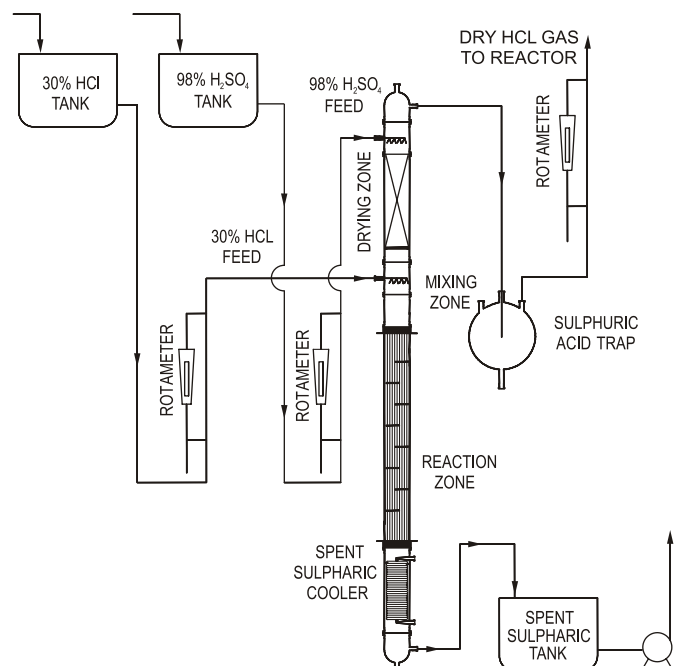
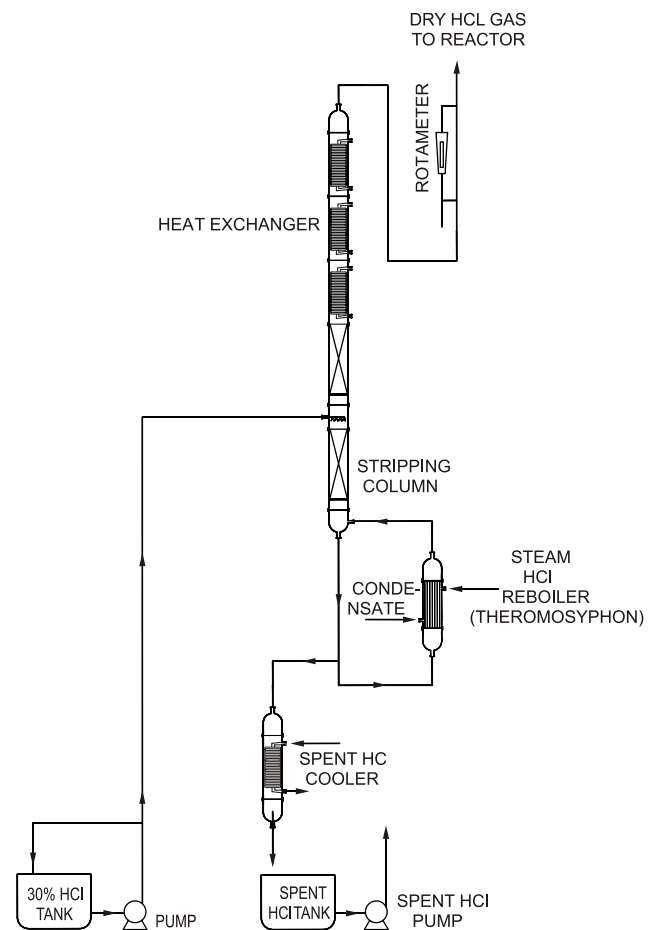
Salient Features

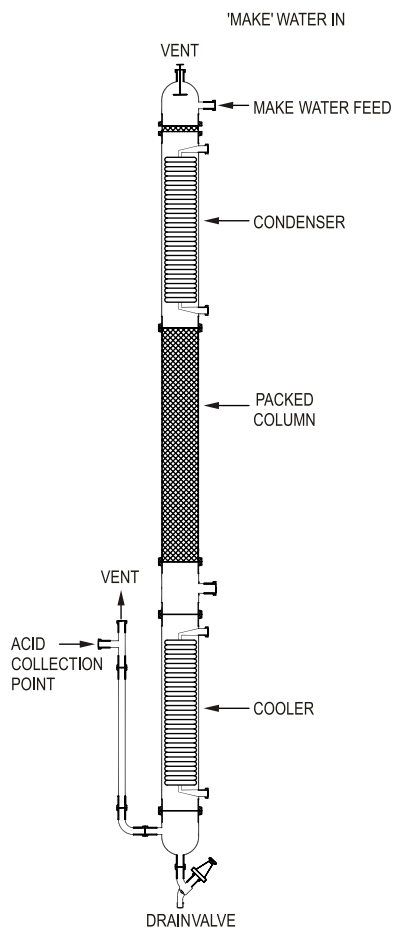
1. Operational reliability – the unit can be started/stopped in seconds.
2. Compact and continuous unit – all operations viz. drying, mixing, gas generation and cooling achieved in same unit.
3. Available in wide range capacities – from ±5kg to 200kg/hr of dry HCl.
4. Except cooling water no other utility e.g. Steam, chilled water etc. are required.
5. Anhydrous gas.
6. Ease of installation.
7. Capable of operating from 25-120%.
8. Negligible pressure drop
9. High efficiency – 99%.

Raw Material Requirement

The indicative requirements for 20 kg/hr HCl gas generator are given below:

1. 30% HCL - 70
2. 98% H₂SO₄ -170
3. Cooling Water 2 m³/hr





HCL GAS ABSORBER (ADIABATIC TYPE)

Process Description

HCL absorption columns are used for absorption of Hydrochloric gas, which statutorily are not permitted to vent into the atmosphere, and to produce the HCl acid.

The column is constructed with a series of packed sections, a gas introduction point below that, a condenser on the top, and a cooler at the bottom. Make water is sprayed from the top and acid is collected from the bottom.

HCL absorption columns are available in 80DN to 300DN diameter (for the gas rate 10 Kgs/hr to 300 Kgs/hr approx).

PACKED COLUMN	CONDENSER HTA	GAS RATE (APPROX.)	CAT. REF.
80mmx3m	0.35m 2x2	10Kg/hr	HCL 3
100mmx4m	0.5m 2x2	20Kg/hr	HCL 4
150mmx4m	1.5m 2x2	60Kg/hr	HCL 6
225mmx4.5m	2.5m 2x2	150Kg/hr	HCL 9
300mmx4.5m	2.5m 2x2	300Kg/hr	HCL12

HCL GAS ABSORBER (Falling Film Type)

Process Description

Hydrogen Chloride gas is produced from the variety of process industries & mainly from chlorination operation. This must be scrubbed before venting to the atmosphere. Hydrogen chloride has great affinity of water and easily absorbed in water. The absorption of Hydrogen Chloride gas in to water cause large amount of heat, which has to be removed by means of suitable device.

The falling film absorber is the simplest form of HCl absorber, which can be operated continuously. Falling Film Absorber is a vertically mounted shell and tube heat exchanger. The standard configuration of the falling film absorber consists of a suitable shell and tube heat exchanger with the necessary drain outlet for the acid. The Hydrogen Chloride Gas enters at the top of the absorber and flows concurrently with water/Dilute HCl. Cooling Water is circulated through shell side of the Falling Film absorber to absorb the heat generated by the dilution of Hydrochloric acid gas with water. Due to its unique design and construction, the heat of absorption is efficiently removed at the zone of absorption, thereby making the absorber extra efficient. Thus the higher concentration of acid is produced due to low absorbing temperature.

Capacity Range : 10Kg /hr to 900 KG/hr.

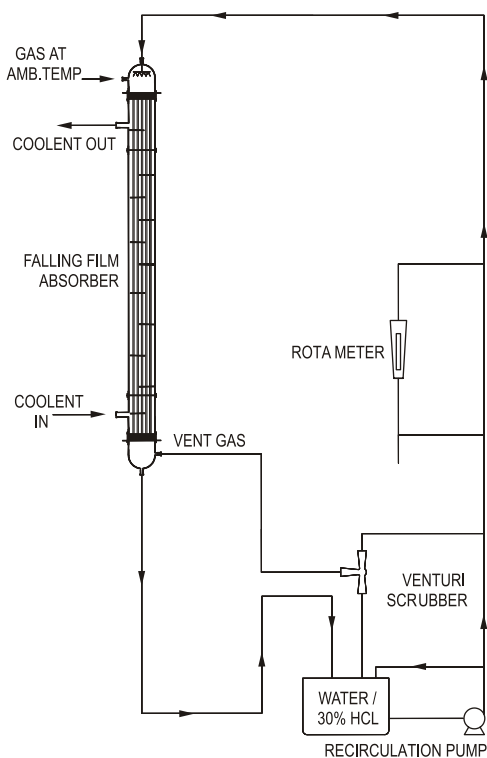
Available up to 600mm dia.

Salient Features

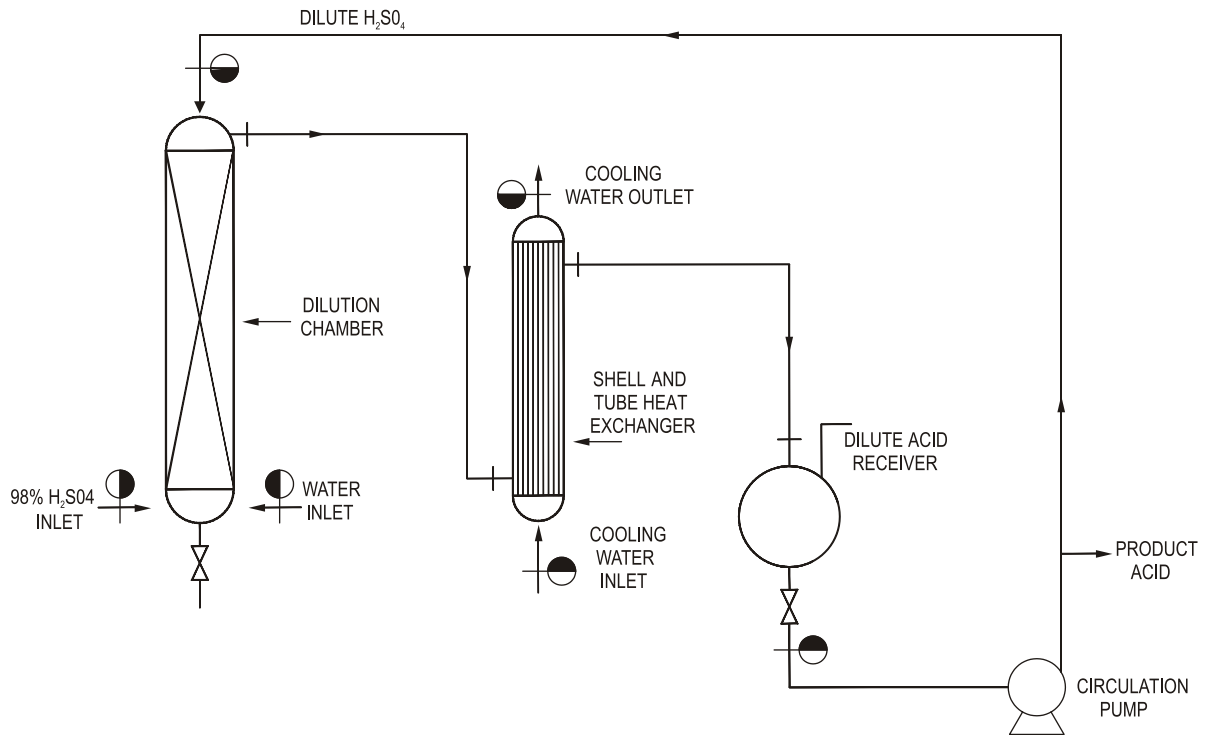
1. High absorption efficiency.
2. High acid concentration achievable.
3. Low outlet temperature.
4. Easy operation and maintenance.
5. Safe Operation due to low isothermal temperature.
6. Handle a wide range of gas loading with minimum liquid flow rates to maintain full tube wetting.
7. All the wetted parts of the falling film absorber are corrosion resistant to all the aggressive gases even at elevated temperatures.
8. Variation in Hydrogen Chloride Gas flow rates or Composition causes no operation problem.

Other Area of Application

Hydrogen Chloride Gas / Sulphur Dioxide Gas Absorption Hydrogen Chloride Gas / Chlorine Gas Absorption Hydrogen Chloride Gas / Chlorine Gas / Sulphur Dioxide Absorption Hydrogen Bromide Gas absorption.



SULPHURIC ACID DILUTION PLANT



Description

The unit consists of a Dilution Chamber, followed by a Heat Exchanger. Dilution Chamber is used for diluting concentrated Sulphuric acid to the desired concentration and the Heat Exchanger is used for bringing down the temperature of dilute acid to desired temperature (When the concentrated acid mixes with water, large amounts of heat are released). The Heat Exchanger is of Shell and Tube type to dilute the acid. The acid should be added slowly to cold water to limit the buildup of heat. If water is added to the concentrated acid, enough heat can be released at once to boil the water and spatter the acid. Sulphuric acid reacts with water to form hydrates with distinct properties.

The system consists of

1. Dilution Chamber with accessories -Glass.
2. Heat Exchanger - Glass.
3. Glass Buffer as Receiver & Circulation of dilute acid (Optional).
4. Dilute Sulphuric acid Circulation Pump (Optional).
5. Glass Pipelines, Valves, & Fittings and Thermo well.
6. Non - Return Valve for Acid & Water Inlet.
7. Expansion Bellows In PTFE for all Nozzles of Glass Components.

Outstanding Features

1. Continuous method of producing the broad range of sulphuric acid grades (Dilute sulphuric acid from 98% to 10% ~ 15%)
2. The all Glass & PTFE construction of plant eliminates the material corrosion and allows this profitable operation to take place safely.
3. The unit can be offered vertical or horizontal as per site layout.
4. Compact design. The equipment is simple and easy to operate.
5. Control outlet acid temperature
6. Design temperature: 160 Deg C

ROTARY FILM EVAPORATOR

We offer a wide range of solutions based on evaporation in different application fields.

Application

Batch or Continuous Operations under vacuum or atmospheric pressure.

"Evaporation of solvents containing heat sensitive materials or solids under reduced pressure.

Vacuum drying of wet solids. Especially designed for high boiling solvents. Degassing of liquids.

Principal of Rotary Evaporator

1. Thin Film Evaporation.
2. Large Surface Area
3. Uniform transfer of heat through its glass wall to the thin film.

A wide range of evaporation flask volumes from 1 liter up to 50 liter allows finding an appropriate size of distillation performance from the Lab up to the Production Plant.

Its broad temperature range from +20°C to 180°C opens up a wide range of application and it's modular design makes it possible to fully adapt the evaporator to your individual needs .

Outstanding Features

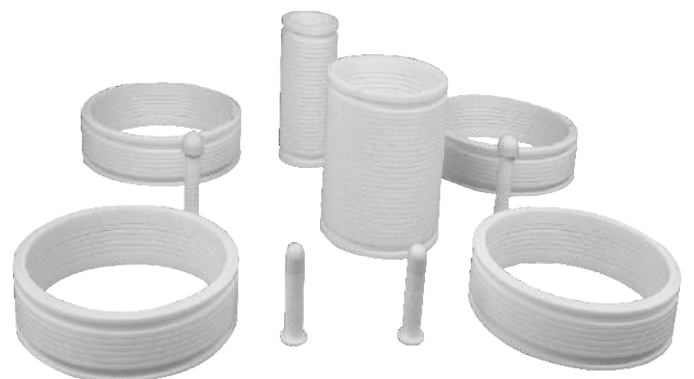
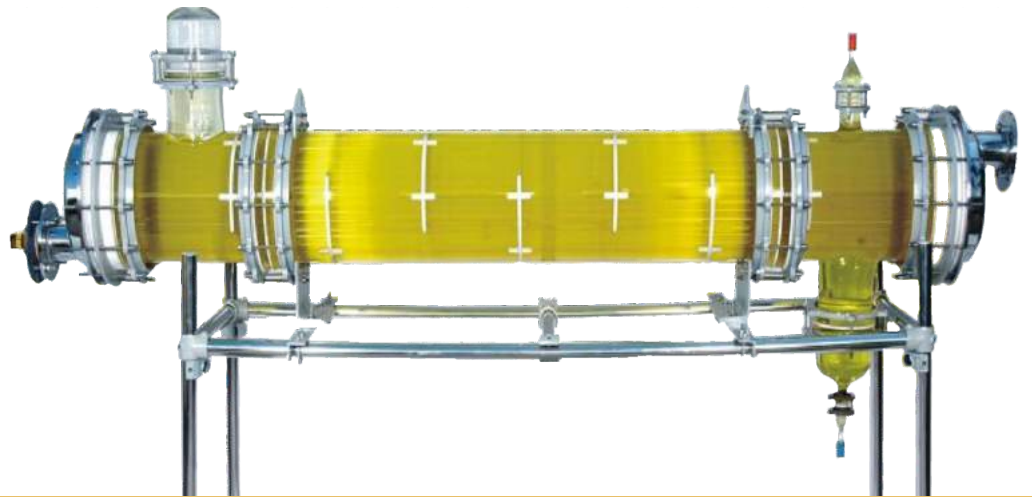
1. High performance sealing system.
2. Dual over- temperature cutout devices
3. Manually adjustable maximum temperature control
4. Protection hood for the oil/water bath & rotating flask
5. All components are designed to suit high Vacuum
6. High efficiency with limited space requirements
7. High Distillation rates/Solvent Recover
8. Low Operating Temperature
9. High purity of distillate/Solvent
10. All evaporators can be upgraded for future needs.

Overview of the System

A typical set up of Rotary Evaporator glassware consists of an evaporating flask, a receiving flask & a condenser. The evaporating flask holds the sample to be evaporated. Once a sample is placed in the evaporating flask, it is lowered in to a heated water bath and is rotated in the water bath. The rotation of the evaporation flask creates a thin film of sample on the inside of the glassware. Increase surface area encourages evaporation of the molecules. Heated water encourages the free flow of molecules to move toward the condenser to be collected in the receiving flask. The receiving flask collects the condensate that comes from the condenser for evaluation of the pure solvent or proper waste disposal

The system consists of

1. Evaporating Rotating Flask 1 no.
2. Sparkless Induction Electric gear motor 1 no.
3. Cooling Condenser 1 no.
4. Receiver Flask 2 nos.
5. Instrument panel includes
6. RPM Controller
7. Bath Temperature Controller Stand





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