



Reaction Unit



Filter Unit



Synthesizer



Fractional Distillation Unit



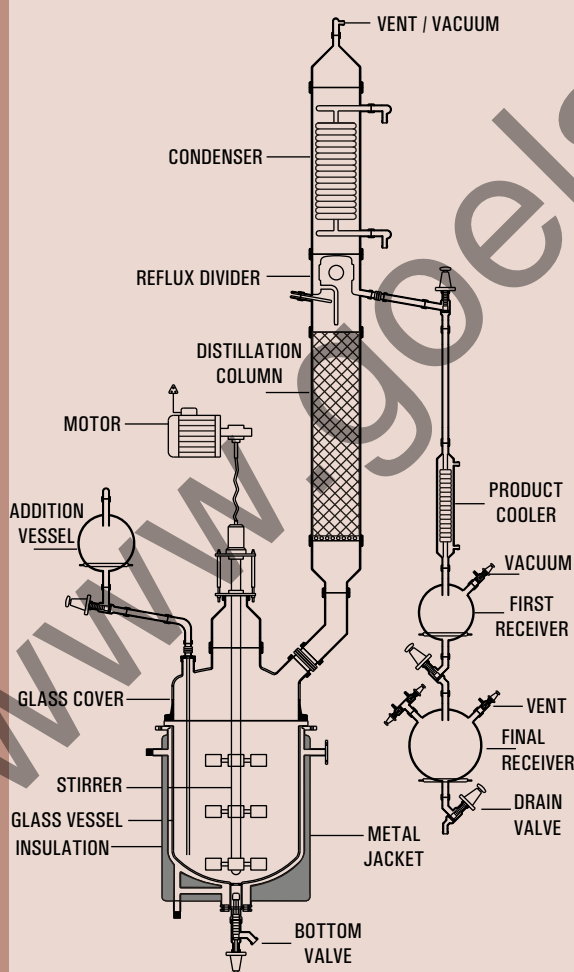
## INTRODUCTION

Standard Units/ Assemblies are multi-purpose units having flexibility of utility. These units have been standardized by incorporating all basic & essential features such as heating, stirring, condensation, fractionation, cooling etc. for multi-purpose use. Therefore, though termed "Standard Units" from constructional view point 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.

## STANDARD UNITS

1. Glass Reactor With Metal Jacket
2. Simple Distillation Unit
3. Reaction Unit
4. Fraction Distillation Unit
5. Reaction Distillation Unit
6. Liquid-Liquid Extraction Unit
7. Solid-Liquid Extraction Unit
8. Assembly over GLR
9. Flanged Reactors
10. Multi Purpose Unit
11. Mobile Mixing System



### GLASS REACTOR WITH METAL JACKET

According to the customer's requirements and standard, we manufacture jacketed glass reactor which has many functions to satisfy kinds of experiments. Goel Scientific offers Glass Reactor with Metal Jacket for chemical & pharmaceutical industries for process development. Glass reactor will have metal jacket and metal insulation.

**Glass / Glass Lined Reactor (GLR) :** 5-500 liter

**Pressure:** - up to 1 Bar

**Temperature:** -50°C to +200°C

**Material:** Borosilicate glass 3.3 /PTFE/ SS 316.

#### Key Features:

- Reactor lift for easy opening i.e optimised for easy vessel cleaning
- Temperature monitoring and control
- Gas purging available
- Vacuum / exhaust piping arrangement
- Additional feeders / receivers as per requirement
- Solid feeding arrangement
- Ready for Cryogenic reactions (-50°C)
- Mixed systems with pressure reactor and vacuum distillation

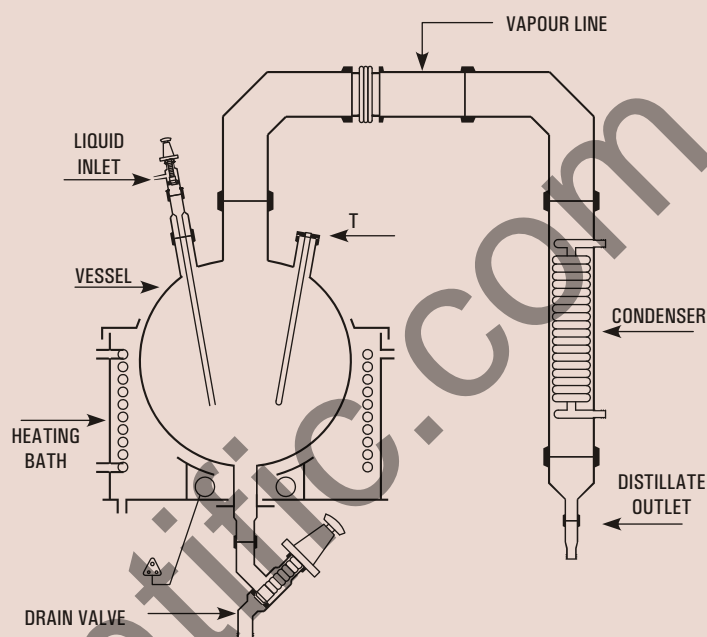
# STANDARD UNITS

## SIMPLE DISTILLATION UNITS

It consists of a vessel mounted in a heating bath and fitted with a condenser for condensing the vapours. A receiver with drain valve can be added for receiving the condensate.

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

Unit Cat.Ref.	Reactor Capacity	Bath KW	Vapour Line	Condenser M <sup>2</sup>
SDU20	20 L	4.5	80 DN	0.35
SDU50	50 L	6.0	100 DN	0.50
SDU100	100 L	9.0	150 DN	1.50
SDU200	200 L	12.0	150 DN	1.50
SDU300	300 L	16.0	225 DN	2.50



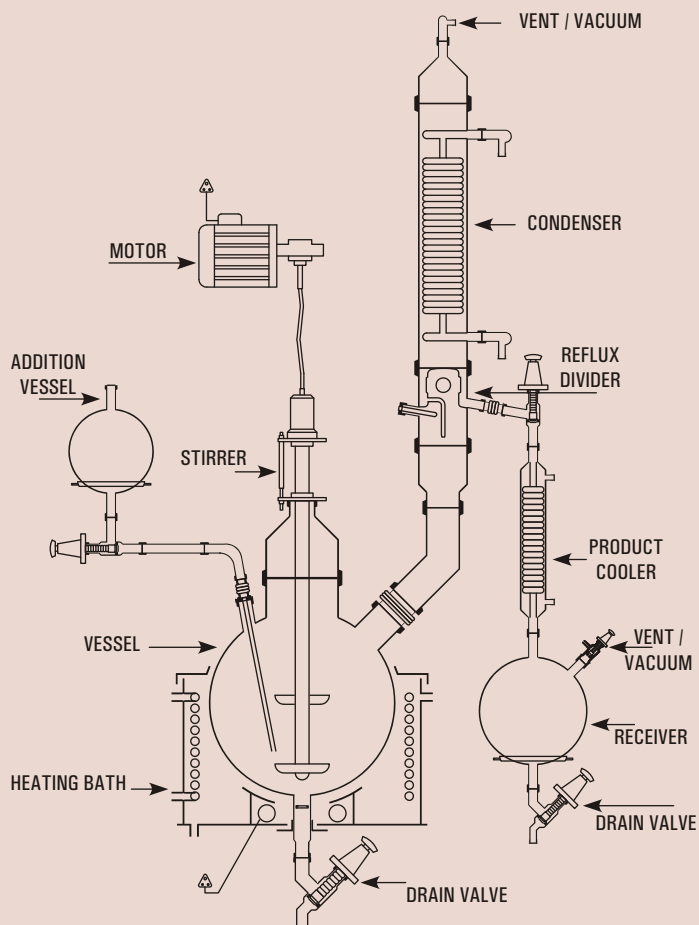
## REACTION UNIT

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 & 200L and is suitable for operation under atmospheric pressure and full vacuum.

Unit Cat.Ref.	Reactor Capacity	Bath KW	Addition Vessel	Vapour Line	Condenser HTA M <sup>2</sup>	Cooler HTA M <sup>2</sup>	Receiver Size
RDU20	20 L	4.5	2 L	80 DN	0.35	0.10	5L
RDU50	50 L	6.0	5 L	100 DN	0.50	0.20	10L
RDU100	100 L	9.0	10 L	150 DN	1.50	0.35	20L
RDU200	200 L	12.0	20 L	150 DN	1.50	0.35	20L
RDU300	300 L	16.0	20 L	225 DN	2.50	0.50	20L



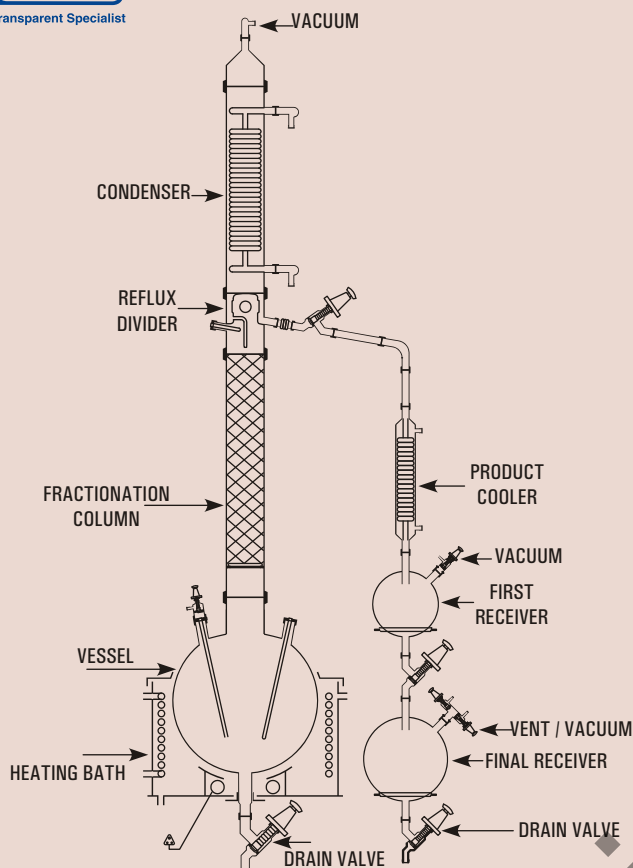
# STANDARD UNITS

## 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 is suitable for operation under atmospheric pressure and full vacuum.

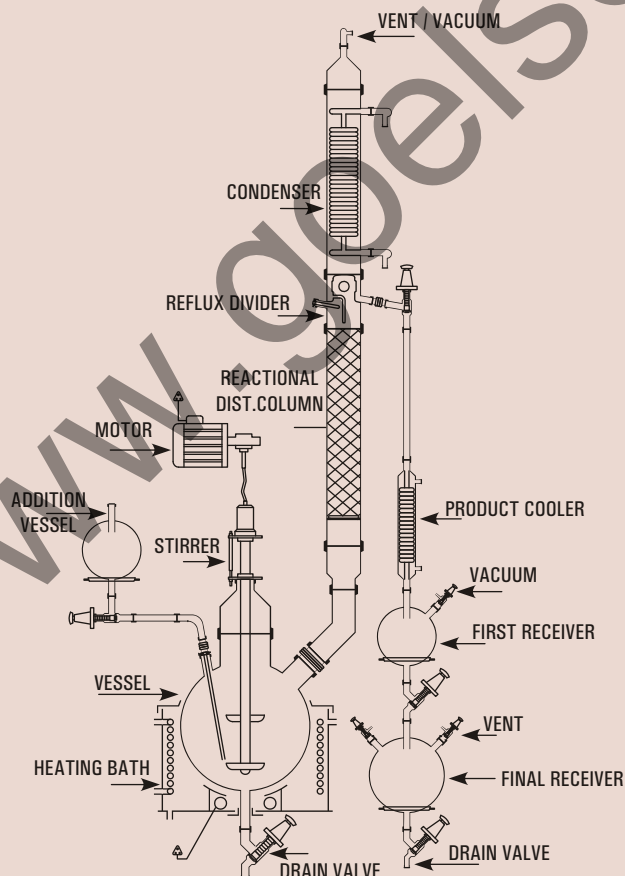


Unit Cat.Ref	Reactor Capacity	Bath KW	Addition Vessel	Vapour Line	Condenser HTA M <sup>2</sup>	Cooler HTA M <sup>2</sup>	Receiver Size
FDU20	20 L	4.5	2 L	80 DN	0.35	0.10	5L
FDU50	50 L	6.0	5 L	100 DN	0.50	0.20	10L
FDU100	100 L	9.0	10 L	150 DN	1.50	0.35	20L
FDU200	200 L	12.0	20 L	150 DN	1.50	0.35	20L
FDU300	300 L	16.0	20 L	225 DN	2.50	0.50	20L

## REACTION 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 is suitable for operation under atmospheric pressure and full vacuum.



Unit Cat.Ref	Reactor Capacity	Bath KW	Addition Vessel	Vapour Line	Condenser HTA M <sup>2</sup>	Cooler HTA M <sup>2</sup>	Receiver Size
FRU20	20 L	4.5	2 L	80 DN	0.35	0.10	2L, 5L
FRU50	50 L	6.0	5 L	100 DN	0.50	0.20	5L, 10L
FRU100	100 L	9.0	10 L	150 DN	1.50	0.35	10L, 20L
FRU200	200 L	12.0	20 L	150 DN	1.50	0.35	10L, 20L
FRU300	300 L	16.0	20 L	225 DN	2.50	0.50	20L, 20L



# STANDARD UNITS

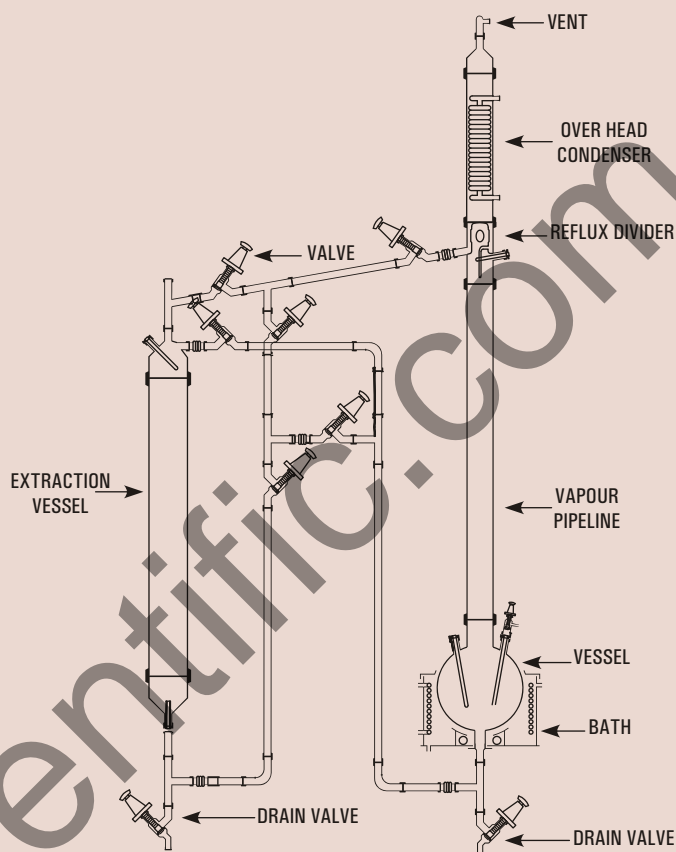
## LIQUID-LIQUID EXTRACTION UNIT

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 & 50L and is suitable for operation under atmospheric pressure.

Unit Cat.Ref.	Reactor Capacity	Bath KW	Vapour Line	Extraction Vessel	Condenser M <sup>2</sup>
LLU10	10 L	3.00	40mmx1m	10 L	0.35
LLU20	20 L	4.50	50mmx1m	20 L	0.50
LLU50	50 L	6.00	80mmx1m	50 L	1.50



## SOLID-LIQUID EXTRACTION UNIT

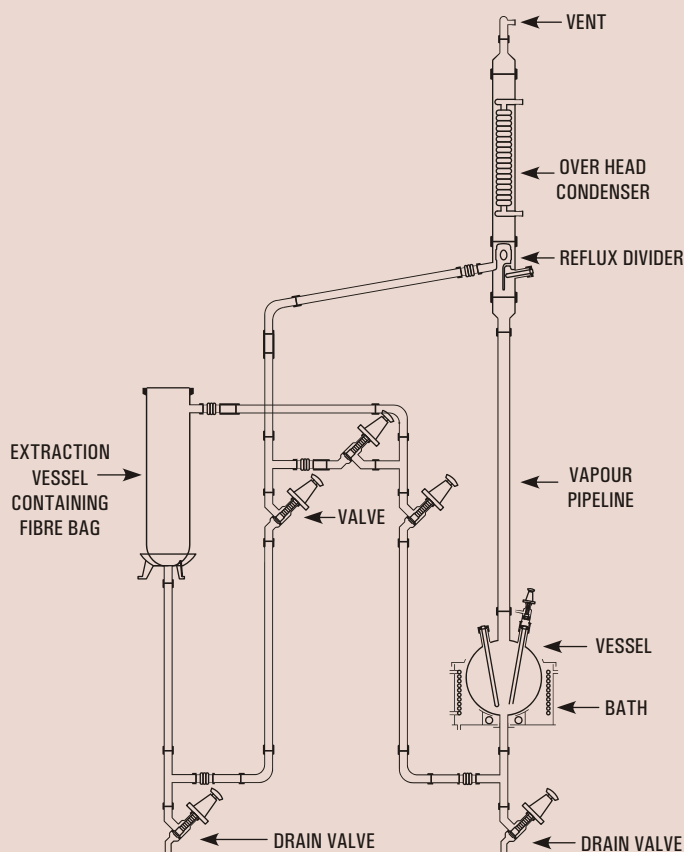
This operation involves preferential solubilising of one or more soluble constituents (solutes) of a solid mixture by a liquid solvent. The unit described here is for a semi-batch operation.

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 & 50L and is suitable for operation under atmospheric pressure.

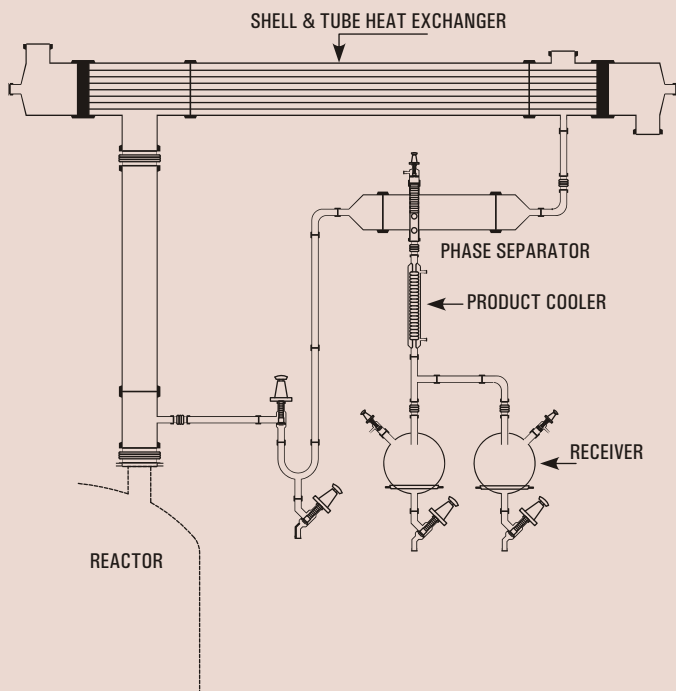
Unit Cat.Ref.	Reactor Capacity	Bath KW	Vapour Line	Extraction Vessel	Condenser M <sup>2</sup>
SLU10	10 L	3.00	40mmx1m	10 L	0.35
SLU20	20 L	4.50	50mmx1m	20 L	0.50
SLU50	50 L	6.00	80mmx1m	50 L	1.50



## STANDARD UNITS

### ASSEMBLIES OVER GLASS LINED REACTOR

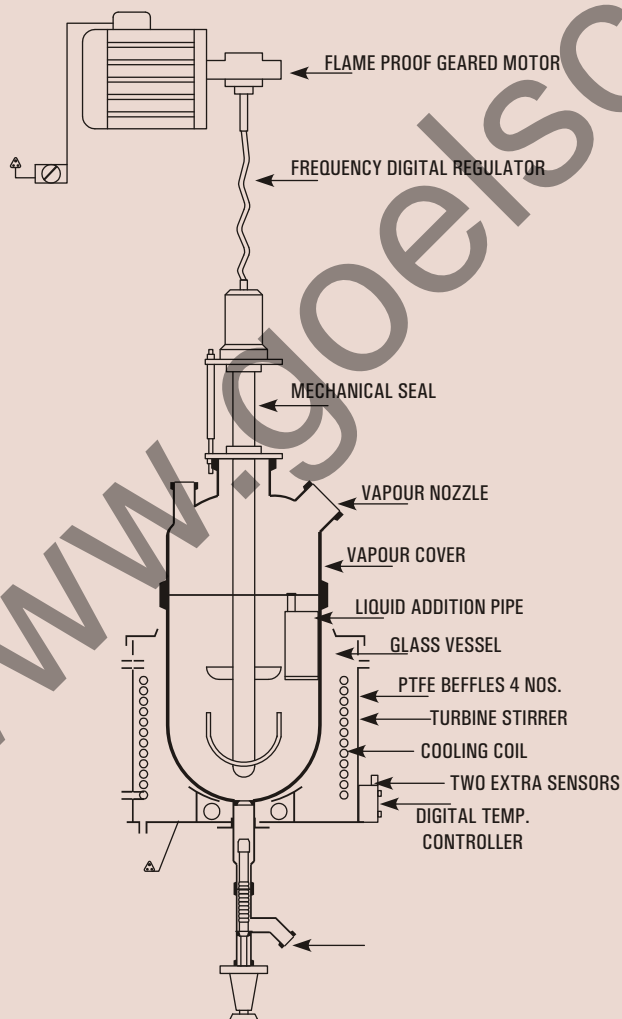
Glass Lined Reactors are used instead of glass reactors specially when scale of operation is large and relatively high pressure steam is to be used as heating media. Quite often assemblies like Simple Distillation Unit, Reaction Distillation Unit, Fractional Distillation Unit etc. are installed above 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.



### FLANGED REACTORS

Designed for use in research & development or in pilot plant operations. Our standard Flanged Reactors are provided with cylindrical vessel with wide diameter. Glass Cover with Vapour Nozzle & Feed tube, Flush Bottom Valve, Extra Heating sensors for better heating, PTFE Battery, Flame-proof Electrical Heating Bath/Mantle, Glass Turbine Stirrer, Epoxy coated coupling & PTFE Gaskets.

All wetted parts are made of borosilicate glass or PTFE for optimum compatibility of reactants.

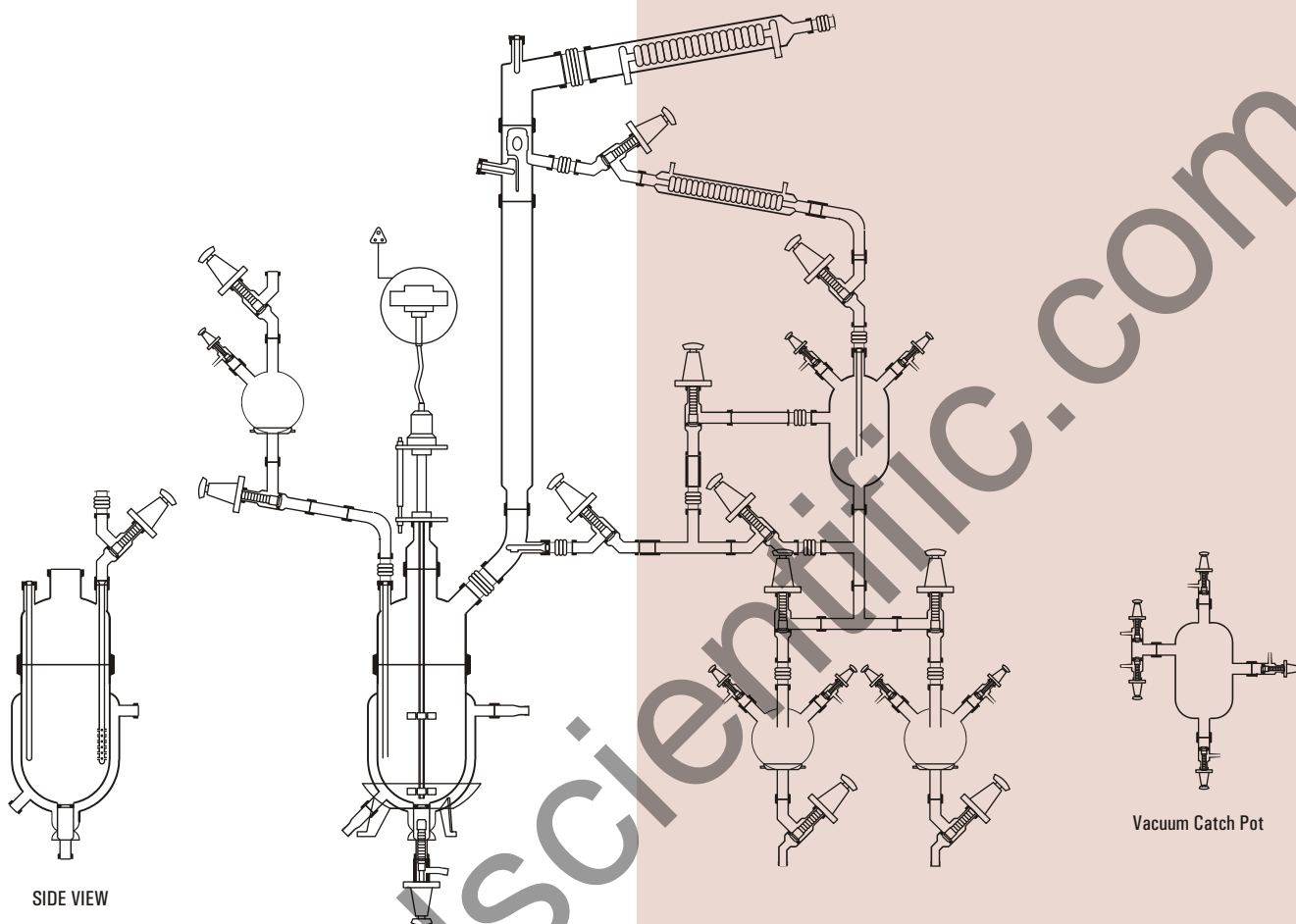


#### Size :

Cat.Ref.	DN	Actual Capacity
VZR 25/12	300	25 Ltr
VZR 50/16	400	54 Ltr
VZR 100/18	450	101 Ltr
VZR 200/24	600	198 Ltr

# STANDARD UNITS

## MULTI PURPOSE UNIT



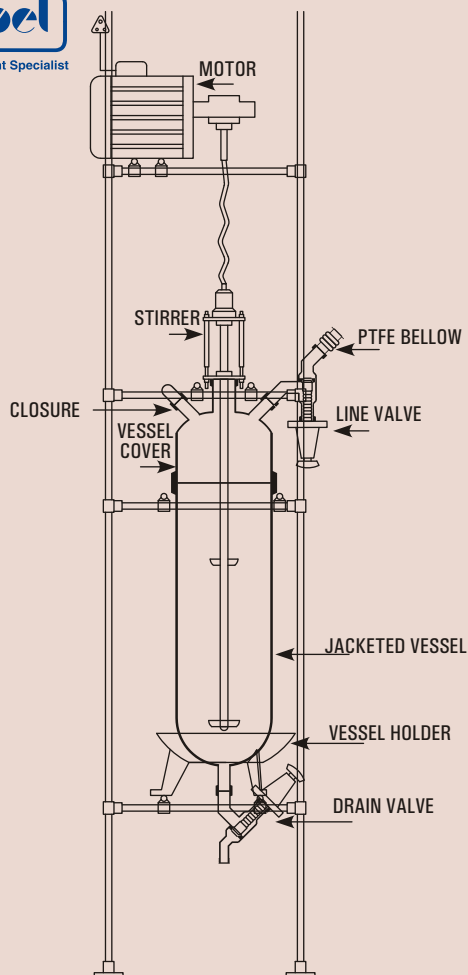
Goel Offer multipurpose pilot plant for chemical and pharmaceutical industries for process development, scale-up, process simulation and kilo-scale cGMP production in batch and semi-batch operation. The pilot plant used for chemical processing includes solid charging, liquid charging, reaction, heating / cooling, rectification, auto / manual reflux arrangement, layer separation, product cooler, vacuum catch pot, vacuum header etc.

The multipurpose pilot plant designed in such a way that we can modify the same easily as per process requirement.

### Available with

- Jacketed full glass reactor/ Cylindrical full glass reactor with Oil heating cooling bath / Spherical full glass reactor with Oil heating cooling bath
- Multipurpose glass distillation overhead
- Stainless steel / MS epoxy coated / MS painted frame supporting
- Flame proof / Non flame proof / cGMP / non GMP models available
- Excellent corrosion resistant.
- Temp. Controller.
- Gas purging, solid charging / multi liquid addition.
- Vacuum / exhaust piping
- Additional feeders / receivers
- Solid feeding

Unit Cat. Ref.	Reaction Capacity	Bath KW	Addition Vessel	Vapour Line	Condenser HTA m2	Cooler HTA m2	Receiver Size
MPU 20	20 L	4.5	2 L	80 DN	0.35	0.10	2L, 5L
MPU 50	50 L	6.0	5 L	100 DN	0.50	0.20	5L, 10L
MPU 100	100 L	9.0	10 L	150 DN	1.50	0.35	10L, 20L
MPU 200	200 L	12.0	20 L	150 DN	1.50	0.35	10L, 20L
MPU 300	300 L	16.0	20 L	225 DN	2.50	0.50	20L, 20L



## STANDARD UNITS

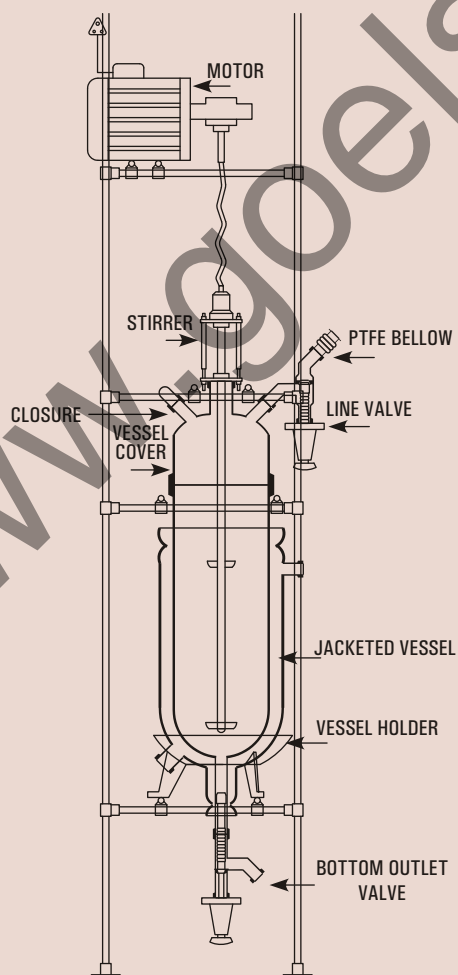
### MOBILE MIXING SYSTEM

Glass Reactors are ideally 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.

#### Cylindrical Mixing Reactor

Cat. Ref.	Vessel Ref.	Nominal Cap. (l)
CGR 20	VSL 20/9	20
CGR 50	VSL 50/12	50
CGR 100	VSL 100/18	100
CGR 150	VSL 100/18	150
CGR 200	VSL 200/18	200
CGR 300	VSL 300/24	300



#### Jacketed Mixing Reactor

Cat. Ref.	Vessel Ref.	Nominal Cap. (l)
JGR 5	VZD 5/6	5
JGR 10	VZD 10/9	10
JGR 20	VZD 20/12	20
JGR 30	VZD 30/12	30
JGR 50	VZD 50/12	50

For Graduation on reactor kindly add G to the Cat. Ref. that means SGR 20 will be marked as SGR 20/G.

Above systems are available with different options, depending upon their size & their utility. Our Technical Department will glad to assist you in finding a suitable solution for your process requirement.

1. Stirrer Drive: Non-Flameproof or Flameproof Motor, 192 RPM with speed regulator.
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: 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 structure are available in Trolley mounted form.
6. Closing Valve: Drain Valve or Flush Bottom Outlet Valve.