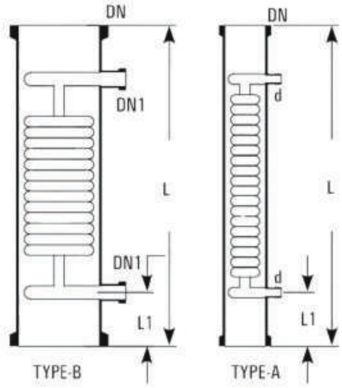
HEAT EXCHANGER

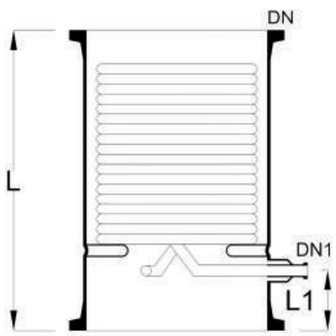
COIL CONDENSER

Condensers are devices designed to condense vapors and cool liquids. They typically consist of multiple parallel coils enclosed within a glass shell. These coils come in various diameters, made from tubes of different sizes.

The average heat transfer coefficients for a coil condenser are approximately 200 to 270 Kcal/m²·hr·°C for condensation and 100 to 150 Kcal/m²·hr·°C for cooling.

Cat. Ref.	DN	d/DN1	L	L1	Type	Actual H.T.A. m2	Cross Area Cm2	Free Coolant Rate Kg/hr.	Max. Jacket Cap. Litre
HE3/3.5	80	16	600	75	A	0.35	5	1300	2
HE4/5	100	19	600	75	A	0.50	30	2400	4
HE4/6	100	19	750	100	A	0.60	30	2400	6
HE6/10	150	25	600	100	B	1.00	52	2600	9
HE6/15	150	25	850	100	B	1.50	52	2600	11
HE9/25	225	25	800	110	B	2.50	125	3300	18
HE12/25	300	25	600	125	B	2.50	175	5700	25
HE12/40	300	25	900	125	B	4.00	175	5700	35
HE16/40	400	25	600	125	B	4.00	450	6200	60
HE16/50	400	25	700	125	B	5.00	450	6200	70
HE18/60	450	40	750	150	C	6.00	820	4800	100
HE18/80	450	40	900	150	C	8.00	820	6200	110
HE24/120	600	50	1250	300	C	12.00	1520	6200	265





Type C

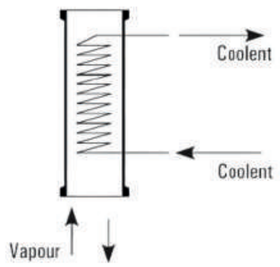
Precautions to be taken in use of condensers

- Vapors should be passed through shell only.
- Maximum pressure of coolant should be 2.7 bars.
- Adequate flow of coolant should be used.
- Steam should not be used in coils.
- Coolant should not be heated to boiling point.
- Coolant control valve should be turned slowly.
- Coolant should be allowed to drain freely.
- Brine can be used in coils in a closed circuit.
- Water main should be connected with flexible hose.
- Ensure no freezing of water remaining in the coils.
- Condensers should be mounted vertically only.
- Condensers can be mounted in series to provide larger surface area.

METHODS OF USE

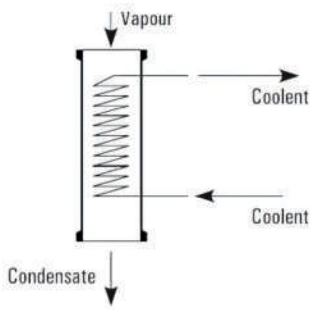
Vapors from the bottom

This method is very simple to install coil condenser on a reactor. However, it tends to produce a significant amount of condensate at its condensation temperature. It's important to ensure that the condensate does not accumulate excessively, as this can cause "logging" in the coils and create back pressure in the system. Typically, a reflux divider is employed below the condenser to take out the distillate.



Vapors from the top

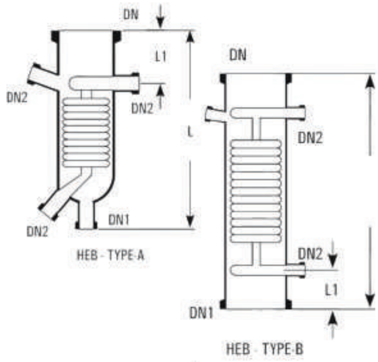
This method produces a cool condensate using the entire cooling surface area. This method should be used where the condensate can lead to "logging" of coils.



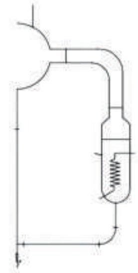
HEAT EXCHANGER

BOILERS

Boilers are utilized to vaporize liquids by passing steam through coils. These boilers consist of several parallel coils encased within a glass shell. Unlike condensers, the coils in boilers are designed to offer a larger cross-sectional area on the shell side. The typical heat transfer rate in boilers is around 350 Kcal/m²·hr·°C at a steam pressure of 3.5 bar.



Cat. Ref.	DN	DN1	DN2	L	L1	Type	Actual H.T.A. m2	Free Cross Area Cm2	Jacket Cap. Litre
HEB4	100	25	25	375	100	A	0.15	40	2
HEB4/4	100	100	25	400	100	B	0.15	40	3
HEB6	150	40	25	450	100	A	0.35	50	5
HEB6/6	150	150	25	500	100	B	0.35	50	7
HEB9	225	40	25	700	100	A	1.00	150	16
HEB9/9	225	225	25	700	100	B	1.00	180	20
HEB12/12	300	300	25	700	125	B	1.30	330	40



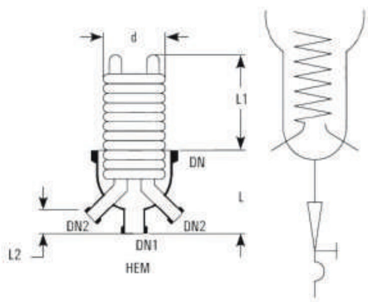
Precautions to be taken in use of Boilers:

- Steam should be passed in the coils at a maximum pressure of 3.5 bar which is equivalent to a temperature of 147°C.
- For higher temperature (maximum up to 200°C) heat transfer fluids can be passed in the coils. - Cold liquids
- Cold liquids should be preheated for better results.
- Boilers should be mounted in an external circulatory loop (as shown in figure) and not direct at the bottom of flask or column
- Under certain circumstances, boilers can be mounted in series to provide larger heat transfer area.

IMMERSIONS

Immersion heat exchangers are designed to manage exothermic reactions in glass vessels. They are suitable for vessels with a wider bottom outlet, such as types VSR and VSE. These heat exchangers feature a central hole through the coil assembly to accommodate a special, extended stirrer that reaches the bottom of the heat exchanger for effective mixing.

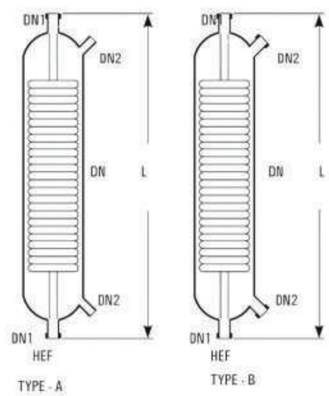
Typically, cooling water is used in the coils, with a maximum pressure of 2.7 bar gauge, though they can also operate with steam at a maximum pressure of 3.5 bar gauge. When using steam, the coils must be fully immersed in the liquid. Immersion heat exchangers are not recommended for use with products prone to crystallization.



Cat. Ref.	DN	DN1	DN2	L	L1	L2	d	Actual H.T.A. m2
HEM6	150	40	25	200	200	75	145	0.4
HEM9	225	40	25	300	200	75	200	0.6

PRODUCT COOLERS

Product coolers are used for cooling of liquids, typically, for the cooling of distillates from the distillation columns.
Unlike coil condensers, in product coolers, product travels through the coil battery and coolant through shell. This provides more resident time to the product be cooled. For direct connection with distillate lines, all the product coolers are provided with 25 DN connections.



Cat.Ref.	DN	DN1	DN2	L	Actual HTA m2	Type
HEF1/1	50	25	12	450	0.1	A
HEF1/2	50	25	12	600	0.2	A
HEF1/3.5	80	25	16	600	0.35	A
HEF1/5	100	25	19	600	0.5	A
HEF1/10	150	25	25	600	0.7	B
HEF1/15	150	25	25	850	1.25	B

HEAT EXCHANGER

SHELL AND TUBE HEAT EXCHANGERS

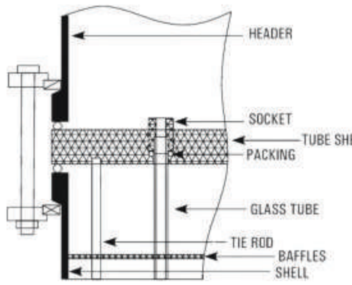
Shell and tube heat exchangers provide a large surface area for effective heat transfer while maintaining a compact design. They are commonly used in various industrial applications, including cooling, heating, condensation, and evaporation.

Key Advantages

1. Universal corrosion resistance, offering a cost-effective alternative to high-priced materials such as graphite, Hastelloy, copper, titanium, tantalum, and other exotic metals.
2. Superior heat transfer efficiency due to the absence of fouling on smooth glass surfaces.
3. Versatile installation options, accommodating both vertical and horizontal configurations.
4. Simple tube replacement for maintenance and cleaning.
5. Available in a broad range of heat transfer areas (HTAs).
6. Lightweight design facilitates easy installation.
7. Cost-effective.
8. Ideal for applications requiring substantial heat transfer areas within a confined space.

ADVANTAGES OVER CONVENTIONAL COIL TYPE HEAT EXCHANGERS

- The overall heat transfer coefficient in shell and tube heat exchanger is about 3 times higher than in coil type heat exchanger.
- The pressure drop in shell and tube heat exchanger is minimal compared to 2-3 kg/cm2 in coil side of coil type heat exchanger.
- For requirement of higher heat transfer areas shell and tube heat exchanger is the only alternative.



CONSTRUCTION FEATURES

The glass tubes are sealed individually into PTFE tube sheet with special PTFE sockets and packing. This unique ferrule type sealing arrangement permits easy replacement and cleaning of tubes. Baffles on shell side ensures improved heat transfer by increased turbulence.

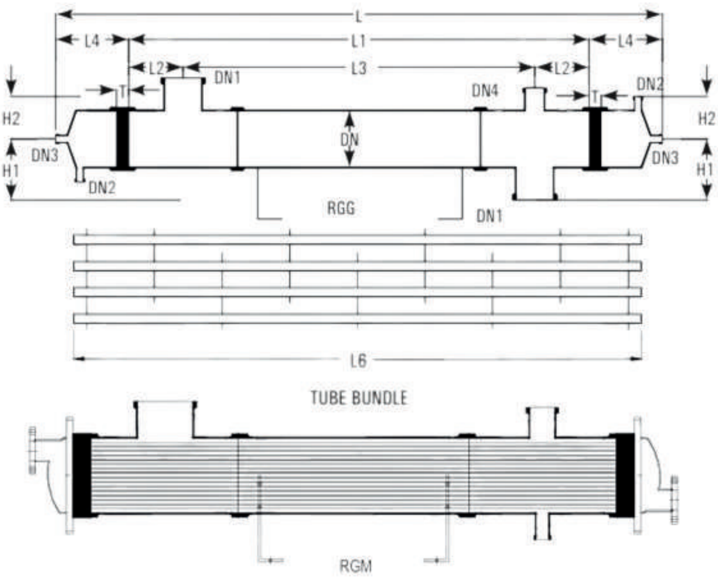
MATERIAL OF CONSTRUCTION OF STHE

Model	Shell	Tube	Header	Duty
RGG	Glass	Glass	Glass	For heat transfer between two agressive media.
RGM	Glass	Glass	Steel/ FRP	For heat transfer between agressive media in shell & non- aggressive media in tubes.
RMG	Steel/FRP	Glass	Glass	For heat transfer between aggressive media in tubes & non-aggressive media in shell.

HEAT EXCHANGER

SHELL AND TUBE HEAT EXCHANGERS

Cat. Ref. RGG/RMG	6/3	6/4	6/5	6/6	9/6	9/8	9/10	9/12	12/12	12/16	12/21	12/25	12/21	12/25
Area (m2)	3	4	5	6	6	8	10	12	12	16	21	25	21	25
DN	150				225				300				400	
DN1	80				100				150				225	
DN2	50				80				80				100	
DN3	25				40				40				50	
DN4	50				50				50				80	
H1	175				250				300				450	
H2	150				200				250				300	
L	2500	3100	3700	4300	2620	3220	3820	4520	2550	3150	3950	4550	3100	3500
L1	1900	2500	3100	3700	1900	2500	3100	3800	1800	2400	3200	3800	2000	2400
L2	150	150	150	150	225	225	225	225	225	225	225	225	400	400
L3	1600	2200	2800	3400	1450	2050	2650	3350	1350	1950	2750	3350	1200	1600
L4	250	250	250	250	300	300	300	300	300	300	300	300	550	550
L5	125	125	125	125	175	175	175	175	175	175	175	175	226	225
L6	1980	2580	3180	3780	2000	2600	3200	3900	1930	2530	3330	3930	2185	2585
T	50				60				75				100	
No. of Tubes	37				73				151				241	
No. of Baffles	11	15	19	23	7	9	13	17	5	7	9	11	5	7



RANGE OF APPLICATIONS

The allowable temperature range for both the shell and tube sides is from 40°C to 150°C, with a maximum permissible temperature difference between the shell and tube sides of 12°C. All sizes and models are capable of withstanding full vacuum on both sides. The maximum pressure limits are detailed in the table below:

		Maximum Permissible Pressure Range, Kg/cm2 (g)		
Model	Side	150 DN	225 DN	300 DN
RGG	Shell Tube	2.0 2.0	1.0 1.0	1.0 1.0
RGM	Shell Tube	2.0 3.5	1.0 3.5	1.0 3.5
RMG	Shell Tube	3.5 2.0	3.5 1.0	3.5 1.0