VESSEL HEATERS AND STAND FOR NON STIRRED REACTOR

Electric Heaters are most popular choice to heat vessel. These are ceramic band heaters enclosed in steel casing. A sensor port is provided to measure heater temperature.
The heater can be provided to accommodate vessel of different diameters from 50 mm to 175 mm

		
Stand and Electric Heater	Welded Jacket	Welded jacket vessel with display unit

Condition where explosion proof conditions are required, KLB can provide welded jacket to control the operating temperature. Temperature sensor port is provided to measure circulating fluid temperature.

Conditions where oil bath is to be used, KLB can provide vessel stand with mount to hold the pressure vessel.

		Aluminum Block Heater with base plate and thermocouple for vessel capacity 50 ml, 100 ml, 300 ml and 600 ml Four cartridge heater of 250 W each are inserted in machined aluminum block. The block is provided with thermal insulation and heat shield. All cables and terminals are completely sealed for heater to be used in flame proof environment**.**

VESSEL HEATER AND STAND FOR STIRRED REACTOR

Compact Reactor Stand for Removable head Stirred Reactor

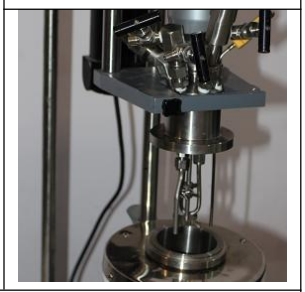



With Aluminum Block Heater	With Ceramic Band Heater

Bench Top Stand for Stirred Reactor







Stand for Removable Vessel head	Stand for Fixed head

The base plate is provided with four buffers to level the reactor and reduce vibrations at high RPM. The mounting steel rods firmly holds motor mounting plate and vessel holding plate.

Removable Vessel Head is placed in the holder and griped firmly. This allows reactor to be used at high RPM without vibration. If the reactor is used without any optional accessory, removable head is convenient to use.

Fixed head design is recommended when optional accessories are to be used with reactor. These options are

- Internal cooling coil with SVM for auto cooling.
- Liquid and/or gas sampling
- Liquid or slurry addition device
- Condenser with back pressure regulator and gas/liquid separator
- Any other custom option

The vessel can be detached from bottom without disturbing any fixture mounted on head.

Materials of Construction

User has to select appropriate material of construction.

Stirred Reactors, Pressure Vessels are normally made of stainless steel 316L.

Typical composition of SS316 is

Material	Fe	Ni	Cr	Mo	Mn	Other
SS316L	65	12	17	2.5	2.0	Si 1.0

Type 316 Stainless Steel is an excellent material for use with most organic systems. A few organic acids and organic halides can, under certain conditions, hydrolyze to form inorganic halogen acids which will attack T316SS. Acetic, formic and other organic acids are routinely handled in T316SS.

T316SS is not normally the material of choice for inorganic acid systems. At room temperatures it does offer useful resistance to dilute sulfuric, sulfurous, phosphoric and nitric acids. Other inorganic acids sulfuric, phosphoric and nitric acids readily attack T316SS at elevated temperatures and pressures.

Halogen acids attack all forms of stainless steel rapidly, even at low temperatures and in dilute solutions. Halogen salts can cause severe pitting in all stainless steels. Chlorides can cause stress corrosion cracking.

Although T316SS offers excellent resistance to surface corrosion by caustics. However, caustics can cause stress corrosion cracking in stainless pressure vessels. This phenomenon begins to appear at temperatures just above 100° C and has been the most common cause of corrosion failure in stainless laboratory vessels.

Monel 400
Typical composition of Monel 400 is

Material	Trade Name	Ni	Cu	Fe
Alloy 400	Monel 400	66	31.5	1.2

Alloy 400 is an alloy comprised essentially of two-thirds nickel and one-third copper. For many applications it offers about the same corrosion resistance as nickel, but with higher maximum working pressures and temperatures and at a lower cost because of its greatly improved machinability.

Alloy 400 is widely used for caustic solutions because it is not subject to stress corrosion cracking in most applications. Chloride salts do not cause stress corrosion cracking in Alloy 400.

It is also an excellent material for fluorine, hydrogen fluoride and hydrofluoric acid systems. Alloy 400 is seldom the material of choice for hydrochloric and sulfuric acids due to its high copper content.
Alloy 400 is rapidly attacked by nitric acid and ammonia systems due to high copper content.

Hastelloy C-276
Typical composition of Hastelloy C276 is

Material	Trade Name	Ni	Mo	Cr	Fe	W	Co	Mn
Alloy C276	**Hastelloy C276**	**53**	**16**	**15.5**	**6.5**	**4.0**	**2.5**	**1**

Alloy C-276 is a nickel-chromium-molybdenum alloy having perhaps the broadest general corrosion resistance of all commonly used alloys. It was developed initially for use with wet chlorine, but it also offers excellent resistance to strong oxidizers such as cupric and ferric chlorides, and to a variety of chlorine compounds and chlorine contaminated materials. Because of its broad chemical resistance, Alloy C-276 is the second most popular alloy, following T316SS, for vessels used in research and development work.

Inconel 600
Typical composition of alloy 600 is

Material	Trade Name	Ni	Cr	Fe
Alloy 600	**Inconel 600**	**76**	**15.5**	**8**

Alloy 600 is a high nickel alloy offering excellent resistance to caustics and chlorides at high temperatures and high pressures when sulfur compounds are present. In caustic environments,
Alloy 600 is unexcelled. It also is often chosen for its high strength at elevated temperatures.
Although it can be recommended for a broad range of corrosive conditions, its cost often limits its use to only those applications where its exceptional characteristics are required.

Titanium
Titanium is an excellent material for use with oxidizing agents, such as nitric acid, aqua regia and other mixed acids. It also offers very good resistance to chloride ions. Reducing acids, such as sulfuric and hydrochloric, which have unacceptably high corrosion rates in their pure form can have their corrosion rates in titanium reduced to acceptable levels if relatively small quantities of oxidizing ions, such as cupric, ferric, nickel or even nitric acid are present to act as corrosion inhibitors. This phenomenon leads to many successful applications for titanium in the hydrometallurgy field where acids, particularly sulfuric acid, are used to leach ores. In these operations the extracted ions act as corrosion inhibitors.
Prospective users must remember that titanium will burn vigorously in the presence of oxygen at elevated temperatures and pressures. While there have been many successful applications in hydrometallurgy where oxygen and sulfuric acid are handled in titanium equipment, the danger of ignition is always present and must be protected against whenever titanium and oxygen are used together.