HORIZONTAL TYPE HIGH PRESSURE HIGH TEMPERATURE INDUSTRIAL AUTOCLAVE

Specifications and general conditions:

1.0	**Scope**
	Design, manufacture, testing, supply, installation, commissioning, training and testing the performance of Autoclave.
2.0	**Size and shape Autoclave**
	Autoclave should be in cylindrical shape with horizontal orientation. The inner chamber dimension will be **900 mm length and 600 mm diameter**.
3.0	**Essential features**
	The autoclave should have the following essential features. • Pressure vessel with air tight door • Air circulation system • Heating system • Pressurization system • PLC based Instrumentation and control system • Safety system • Temperature control system • Provision for vacuum bagging
4.0	**Pressure rating**
	• The chamber along with the door should be rated for a working pressure of 7 bar (minimum) • Factor of safety should be as per ASME, Sec VIII Div. 1 [Party has to design the chamber with compline's to Factor of safety as per ASME] • Rate of pressurization= 0.1 to 0.5 bar/minute (Continuously variable through PLC)
5.0	**Temperature rating**
	• The autoclave chamber along with the door and its gasket should be rated for a continuous working temperature of up to 200 ^{0}C and the working pressure up to 7 bar.

6.0	**Material of construction of Autoclave chamber**
	• Material of construction should be with **P 265 GH PVQ (Pressure Vessel Quality) carbon steel or ASME SA 516 grade 60 steel or ASME SA 516 grade 70 steel.** Material of construction certificate to be provided.
7.0	**Trays for autoclaving**
	• The autoclave to be provided with minimum 2 no's of trays made of **stainless steel, SS 316 L.**
8.0	**Insulation**
	• Internal thermal insulation of suitable design should be provided in the autoclave to prevent heat loss to the surroundings. **Insulation material can be Glass wool or Ceramic wool.** • Machine shall be provided with removable type inside insulation. • Skin temperature of the autoclave outer surface should not exceed 45 ^{0}C on shell surfaces during the operation.
9.0	**Painting**
	• Autoclave exterior painting must be done with high quality epoxy paint. • Interior painting must be done with high temperature aluminum paint to withstand a continuous working temperature of 200 ^{0}C and above.
10.0	**Heating System**
	The inside volume of the autoclave should be heated by means of electric heating. Heating coil must be made of Inconel Nickel Chrome steel. It should have the following specification: Temperature range: Ambient to 200 ^{0}C Heating rate: 1 to 3 ºC/minute (Shall be programmed using PLC) Heating medium: Air
11.0	**Temperature monitoring and control**
	The autoclave must be equipped with temperature sensors **(Make: Honey well- UDC 2500 or Radis or Temson or Fluke)** for monitoring the inside air temperature of autoclave. The controlling chamber temperature by means of digital controller with an accuracy of ±1 ^{0}C or better.
12.0	**Pressure control**
	The autoclave must be equipped with pressure gauge **(Make: Wika or Waaree or Swage lock or Dynamic)** of accuracy ±0.1 bar to monitor the pressure inside the autoclave.

13.0	**Air circulation system**
	The autoclave chamber must be provided with an air circulation system to get desired temperature uniformity inside the autoclave.
14.0	**Safety System**
	Autoclave should have • Suitable pressure relief valve with suitable rating **(Pressure relief valve make: Rego/Atam/Generant)** for over pressure control. • Thermostat for over temperature control. • Door safety interlocks. Door type should be either **Davit arm type or Suspended type or Hinged type.** • Burst disc (1 No. minimum) • Emergency stop • PLC based interlocks for pressure and temperature. **(PLC make: Siemens/Eurotherma/Omron/Schneider)**.
15.0	**Documents to be supplied**
	Two copies of the following documents in English must be provided: • Operation manual. • Manuals for controllers, control valves, control system with circuit diagrams and all other brought out items. • Detailed calibration manual of the system • Calibration and other test certificates. • Warranty certificate for two years. • Manual for PLC programme. • ASME certification for pressure vessel.
16.0	**Other accessories**
	• A full set of tool box for service and maintenance of machine to be supplied by party
17.0	**Scope of VSSC**
	• Civil work necessary for installation • Electrical power supply
18.0	**Warranty**
	The Autoclave must have warranty for a minimum period of 24 months from the date of final acceptance at VSSC.
19.0	**General Guidelines**
19.1	• Quotation for non-comprehensive AMC of the equipment by authorized service

	personnel for five years after the warranty period shall be provided. • Quotation of necessary spares for the next 10 years to be provided as optional item along with the quotation. • The instrument and accessories should work on 230V, 50 Hz power supply (Indian power supply condition). • Pre-installation requirements shall be provided along with the technical bid. • Installation, commissioning and user training in instrument operation at VSSC site shall be provided free of cost.
19.2	All the weld joints of the vessel of pressure vessel must be 100% radiographed**,** hydraulically tested and ASME certificate should be provided.
19.3	All the pre-requisites such as power supply requirements and civil works etc. for the installation of the autoclave must be provided to VSSC with detailed layout immediately after placement of Purchase Order.
19.4	Minimum essential supports/facilities required for the installation work like forklift and electric power shall be provided by VSSC against advance intimation.
19.5	Pre-delivery inspection of the Autoclaving facility will be carried out at the party's work site. The party must provide all relevant certificates of material construction of autoclave chamber and pipe lines, test/calibration certificates of bought out items, details of control panel and electrical fittings. Also party has to provide Electrical assembly diagram, Electrical program details, PLC program details, PLC operating manual and PID diagram (Piping and instrument diagram) for the equipment and accessories. Pressure testing of the autoclave is to be carried out in presence of VSSC personal. **Pressure proof test (PPT) conditions:** Pressure: 9 bar Duration: 30 minutes
19.6	**Detailed Schedule:** 1. Design submission, T1= 1 month from the date of release of Purchase order. 2. Design approval, T2= T1+30 days. 3. Readiness for Pre delivery inspection, T3= T2+7 months. 4. Clearance from VSSC, T4= T3+15 days. 5. Installation and commissioning, T5= T4+2 month.

19.7	The supplier must impart training on operation and maintenance of the whole system to a batch of VSSC personnel in free of cost, after commissioning of the system. Also the autoclave chamber, connecting pipe lines and joints are to be leak tested at VSSC after installation.
20.0	**Pressurization system (Suitable compressor with De humidifier) for Autoclave**
	The compressor **(Make: ELGI or Ingersoll Rand or Atlas Copco)** must be supplied completely with all the necessary control valves & gauges, regulators etc. The details are: • Pressure range: 0 to 12 bar (Capacity/Volume of the compressor to be specified along with the quotation) • Pressurization medium: Air • Rate of pressurization: 1 bar/minute (To meet the specified CFM of Autoclave) • Pressure control accuracy: ±0.1bar or better • Pressure relief valve: Spring loaded valve (Calibration certificate from ASME is required)