

# Animal Laboratory and Vivarium Steam Sterilization Autoclaves



## Features and Benefits

**Lowest Cost of Ownership** - Design characteristics from years of service experience are engineered into the **LS Series** sterilizers. Industrial grade components, precision machining and fabrication, proven mechanical advantages and utility conservation devices provide owners and users with a low maintenance reliable sterilizer.

**Reliability** - Industrial grade valves and high temperature gaskets prevent otherwise costly and common service downtime. The vessel is tested and certified to exceed national pressure vessel standards and carries a manufacturer's warranty.

**Safety** - Operator and technician safety is ensured through temperature and pressure monitoring, relief valves, safety interlocks and manual overrides.

**Serviceability** - Reduce costly maintenance downtime with easy to access consumable and expendable components.

**Simplicity** - The intuitive touch screen interface provides users with clearly identifiable selections to begin cycles.

**Long Life Door Gasket** - Beta Star's high temperature, air actuated door gaskets are seated into a machined groove that provides a close tolerance creating a less strenuous environment, extending door gasket life.

**Made in the U.S.A.** - Manufactured in southeastern Pennsylvania, Beta Star takes pride in their first class ASME certified fabrication and assembly plant. Over 250 employees are committed to the superior quality products we provide.

**Eco Friendly** - Reduce your facility's water footprint with Beta Star's utility conservation features. Mechanical and programmable conservation features are integrated into the Beta Star **LS Series** sterilizer.

## Application

Beta Star supplies sterilization cycle packages for all applications in the pharmaceutical, life science, biotechnology, laboratory, and animal care markets. All **LS Series** sterilizers include Pre-Vacuum, Liquid, Bio-Bag, Hard Goods, Bowie-Dick and a Vacuum Leak Test cycle as standard. Cycle parameters adhere to the guidelines for Industrial Moist Heat Sterilization referred to in document AAMI / ISO 111345-R-8/93.

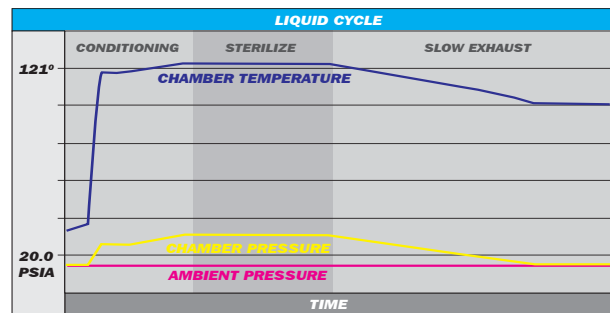
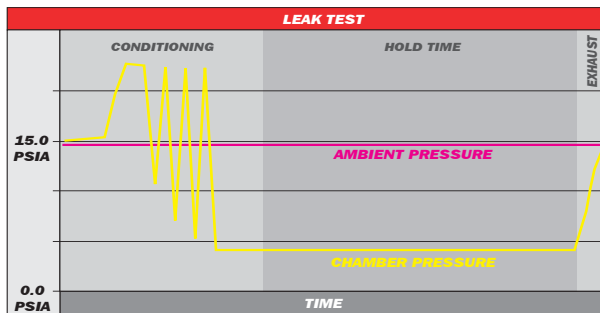
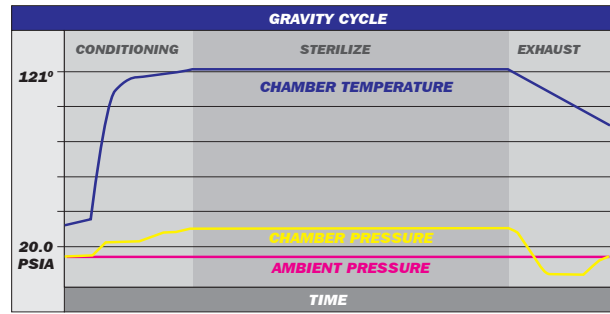
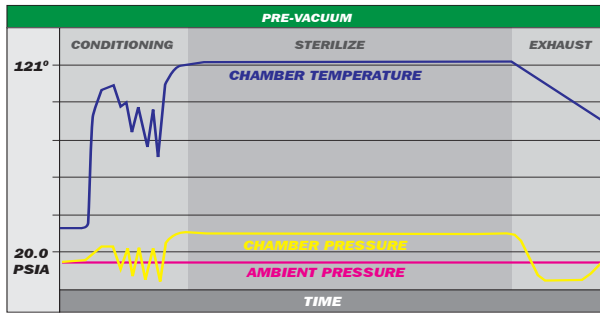
Thirty total cycle recipes can be programmed and stored for specific goods or media using supervisory access. Custom cycle programming is supported by an all encompassing PLC system.

## Design

Beta Star sterilizers are value engineered for maximum throughput, efficiency, serviceability, safety and reliability. Our solid stainless steel rectangular chambers offer dual steam inlet baffles for better temperature distribution, more usable space, center sloping chamber floors to minimize condensate retention, reduce dry time, and allow for simple operation cleanup.

Beta Star steam sterilizers are designed for continuous use with serviceability engineered into every sterilizer. Lengthy downtime has been eliminated through the use of industrial grade non-proprietary components. Our rigid modular frame provides a solid base and framework for easy access to our industrial grade mechanical and electrical components.





## Pre-Vacuum Cycles

**Pre-Vacuum Cycle** - pre-conditioning of load during air removal using programmable ramped positive and negative pressure pulsing to remove entrapped air. Programmable ramped vacuum drying.

**Micro Isolator Cycle** - pre-vacuum cycle using programmable, ramped, positive and negative pressure pulsing to reduce internal and external crazing of animal housing by allowing pressure stabilization to product items being processed.

## Test Cycles

**Leak Test** - programmable vacuum leak test to verify door seal, sterilizer chamber and piping integrity through monitoring of acceptable vacuum loss over selected time.

**A.A.R.T. (autoclave air removal test)** - pre-programmed vacuum cycle used to verify removal of residual air from chamber and load, and ensure steam penetration into the test load.

**Bio-Waste Cycle** - designed for pre-sterilization conditioning through positive and negative pressurization to ensure air removal from mixed products in containers. Programmable ramped steam pressurization is used to maximize heat penetration of mixed laboratory biohazard waste.

**F<sub>0</sub> Temperature Control Cycle** - for the sterilization of heat sensitive materials using time-at-temperature calculations beginning at a predetermined point of the conditioning phase. This reduces the product exposure to higher temperatures normally found in standard sterilization cycles.

**Gravity Cycle** - for non-air retentive products; utilizes positive steam pressure with vacuum assist air removal for conditioning of load. The end of cycle exhaust is programmable for dry and non-dry phases.

## Liquid Cycles

**Liquid Cycle** - cycle used for liquids in vented borosilicate glass or metal containers. Positive steam pressure with vacuum assisted air removal with programmable ramped heating and exhaust to ambient with optional cooling phase.

**Liquid, Air Cool Cycle** - cycle used for liquids in vented borosilicate glass or metal containers. Positive steam pressure with vacuum assisted air removal with programmable ramped heating and introduction of filtered air during exhaust to speed cooling.

**Pre-Vacuum Liquid Cycle** - pre-conditioning of load using programmable, ramped, positive and negative pressure pulsing to assist in removal of entrapped air. Chamber temperatures at negative pressures are controlled to prevent boiling of product. Controlled ramped exhaust to ambient with optional cooling phase.

**Isothermal Cycle** - designed for conditioning of heat sensitive materials at a temperature range of 78°C - 104°C.

**Effluent** - for the processing of items in BSL3 and BSL4 laboratories. The cycle uses a heated, jacketed, 0.2 micron hydrophobic filter to contain biohazard contents in sterilizer chamber while allowing exhaust of sterile gasses.

## Control System

The Laboratory Series (LS) Color Touch Screen PLC features a user friendly interface powered by a robust Programmable Logic Control system. Features include:

- Operator intuitive 5.7" color touch screen display
- Five (5) levels of user login security
- Pre-programmed cycle types
- Thirty (30) stored programmable custom cycles
- Custom cycle names for easy recognition
- Continuous cycle status output
- Help screens / alarms
- Network or data download ports



## Printer

The printer is a 32 column, nine (9) pin dot matrix impact printer. The printer records all cycle set points, cycle phase changes, pressure and temperature at specified time intervals, and alarms. The printer uses easy to change roll paper and ink ribbons.

## Vessel Construction

All Beta Star vessels are manufactured at our corporate headquarters in Honey Brook, PA. All standard vessels consist of a 316L stainless steel chamber and door and 304 stainless steel steam jacket. The chamber and jacket meet the requirements of the ASME Boiler and Pressure Vessel Code Section VIII, Division 1. The vessel chamber, doors and jacket maintain specified operating pressures and temperatures and withstand operation from full vacuum to 45 psig. Two (2) validation ports for load probes are included on all sterilizer chambers. Features include:

- Engineered for optimum life expectancy
- 316L/304 stainless steel construction
- 25 Ra polished chamber finish for sanitary requirements
- Two (2) threaded validation ports for load monitoring
- Machined and polished door gasket groove for extended door gasket life, and greater assurance of seal integrity
- Chambers are designed for maximum loading capacity
- Three (3) sided door retention for additional safety
- Dual steam inlet for uniform temperature distribution

## Piping

All piping assemblies are constructed, tested and fitted using brass and copper connected to the jacket, chamber and drain. Industrial grade pneumatic valves require less maintenance, eliminating costly downtime. Features include:

- Engineered for lowest cost of ownership
- High temperature industrial grade valves
- Pressure relief valves
- Piping designed to reduce condensation and ease of maintenance
- Serviceable piping configuration for P.M. inspections
- Integrated RTD's for constant and accurate temperature monitoring
- Easy-Clean chamber drain strainer
- Stainless steel piping configurations are available

## Door System

Engineered for safety: Each door system is equipped with both automatic locking and sealing subsystems. The locking system is used to ensure that once the door reaches the closed position, the door gasket remains there until the system has reached a safe open state. The sealing system uses compressed air to activate the seal once the door is in the closed and locked state.

Power operated door systems have a closing safety feature that requires the operator to hold the close button until the door is in the fully closed position. Should the operator release the close button before the door is fully closed, the door will auto reverse to the fully open position ensuring proper and safe operation.

Electrical, mechanical and pneumatic safety locks are provided to prevent the chamber from being unsealed or opened while the chamber is under pressure.

## Door Gasket

Beta Star's high temperature, air actuated door gaskets are seated into a machined groove that provides close tolerances, offering a less strenuous operating environment, extending door gasket life.

## Fascia

All Beta Star sterilizers include a number 4 finish, 304 stainless steel, removable front fascia panel to enclose the vessel, mechanicals and the door. Side, back and top panel removable enclosures are available.

## Vacuum System

The Beta Star LS series sterilizer is equipped with a water ejector system. Beta Star's unique piping configuration reduces water consumption while maintaining consistent vacuum and automatically regulates effluent temperature to the facility drain to below locally specified temperature requirements.

## Quality Standards

All sterilizers are factory tested according to Beta Star QA and testing procedures. The results of each test are recorded and stored on the Quality Control Record (QR-001). This testing includes: instrument calibration to NIST standards, electrical input and output verification, Leak Test, Bowie & Dick Test, alarms verification, hazards test, and consecutive execution of sterilization cycles to insure repeatability. Temperature control to within +/- 0.5°C is verified for all sterilization cycles. The following listings and standards are met, exceeded and carry identifiable labeling.

- **Underwriters Laboratory (UL) Standard**
- **ASME Code, Section VIII, Division 1** for pressure vessels.
- **Canadian Standards Association (CSA)**

## Safety Features

Beta Star sterilizers are safe to operate. They all contain safety checks and balances that ensure operator safety.

- An auto abort system for abnormal chamber conditions
- An interlocking door that will stay closed under chamber pressure
- Key lock system that ensures only authorized users have access to the sterilizer
- A pneumatic override of steam to chamber valve
- Safety door handle that will bend but not break if too much operator pressure is applied when the door is locked

## Control System Options

The Beta Star LS Touch Screen control system is equipped to handle advanced cycle functionality.

- **F<sub>0</sub> Cycle:** The F<sub>0</sub> Cycle calculates the sterilization time based on load temperature and duration exposed. These calculations are based on predetermined set points. The result is reduced exposure time.
- **Air Over Pressure:** This option provides filtered air pressure to the chamber to cool the load and improve exhaust time. This feature is used in the processing of liquids to reduce the cycle time and prevent boil over.
- **Isothermal Cycle:** This is a low temperature cycle used in disinfection or pasteurization of heat sensitive solutions.
- **Full or Partial Remote:** Sterilizers equipped with a second door as a pass through can be equipped with full control capabilities or partial control capabilities for monitoring system status.
- **Allen Bradley Compact Logix:** An Allen Bradley non-proprietary PLC is available with the Beta Star LS series sterilizers.
- **Nema 4x Enclosure:** For facilities who require specific control enclosures.
- **Foot Pedal:** A foot pedal for operating the automatic sliding door can be used where hands free operation is necessary.
- **Load Probe:** A load probe for temperature monitoring can be added through one of the included validation ports.

## Vessel Options

The Beta Star vessel can be configured to enhance functionality.

- **Double Door:** Beta Star LS Sterilizers can be configured with a second door to be used as a pass through system. Double door sterilizers can be equipped with a full or partial secondary control.
- **Sanitary Ports:** The chamber ports can be upgraded with sanitary ports accepting thermocouple fittings for use with critical media or goods.
- **20 Ra. Polish:** The internal chamber and door can be polished to a 20 Ra. finish or better for critical applications.
- **316L Steam Jacket:** The standard 304 stainless steel steam jacket can be upgraded to 316L stainless steel.
- **Seismic Restraints:** For equipment being installed in areas of seismic activity, a seismic restraint or tie-down is used.
- **Chamber Passivation:** An internal surface chamber passivation can be applied to the sterilizer. This process removes impurities and inhibits further corrosion.
- **Dual Drain:** Allows for improved temperature distribution.
- **Jacket Idle:** Holds jacket at lower temperature for utility conservation when the unit is not in cycle.

## Piping Options

Sterilizer jacket and chamber piping can be configured to meet process requirements and are upgrades.

- **316L Stainless Steel Piping** with threaded and swagelock fittings, and stainless steel process valves.
- **Sanitary Piping:** 316L stainless steel, orbital welded, sanitary piping and process valves can be added for high level sterilization.

## Steam Source Options

The Beta Star LS Steam Sterilizers are used for moist heat sterilization. Steam requirements vary based on model size and options. The following are the steam supply options:

- **House Steam:** House steam is when the facility or building is equipped with a steam source that can supply the sterilizer with the required steam utility.
- **Integral Electric Boiler:** An integral electric boiler is used to generate steam if there is no building steam available. Integral boilers sit within the footprint of the sterilizer.
- **Stainless Steel Boiler:** For use with sensitive media or goods, a stainless steel steam generator can be used to produce clean steam with DI water.
- **Steam to Steam Generator:** A heat exchanging system used to create clean steam from a pure water source and house steam or electric boiler system. These systems are connected directly to the chamber.

## Air Compressor

A laboratory grade air compressor can be used when facility supplied compressed air is not available.

## Process Options

Non standard options used in the processing of goods or media include:

- **Air Inlet Insitu Filter:** An air inlet filter rated at 0.2 um. For use in high level sterilization.
- **Stainless Air Inlet Housing:** A stainless steel housing that allows the insitu filter to be sterilized

## Loading Cart

The heavy duty 316L stainless steel loading cart is designed to hold the goods or media to be sterilized. The loading cart comes equipped with adjustable shelves to accommodate various products.

## Uninterrupted Power / Backup Power

An uninterrupted power supply (UPS) system can be integrated into the sterilizer configuration. This option helps prevent against voltage spikes, drops and loss. This system works by having an internal checking system that when power loss is recognized, a sterilizer alarm goes off and the system goes into "abort" conditions which will hold the sterilizer in safe mode until electric service is being provided to the unit.

### **Biocontainment Seal**

An optional biocontainment flange is welded to the vessel. The flange serves as a sealed and ready-to-install rigid support for our adaptable biocontainment extension panels, ensuring a reliable and turnkey pathogen barrier for containment applications.

### **Effluent Package Option**

Our design prevents harmful pathogens and viruses from exiting the sterilizer at any time during the sterilization process. Pathogens are retained until the required sterilization exposure time has been achieved.

Our standard steam sterilization cycles exhaust through a heated 0.2 um hydrophobic filter in order to prevent pathogens and viruses from exiting the sterilizer prior to fulfilling sterilization time and temperature requirements. Sloped chamber base and internal liquid dams retain effluent during the entire sterilization period.

### **Serviceability**

Service access will be from the top, and control side of the sterilizer. Electrical wiring, pneumatic valves and tubing is clearly labeled and visibly traceable. Standard piping components are copper brazed or compression fittings and threaded brass components, positioned for safe and easy replacement. All wiring and piping are non-proprietary industrial grade components available direct through a local supply house, authorized service agency, or direct through the Beta Star Parts Department.



### **Quality Documentation**

Quality documentation packages can be included into your sterilizer package. Quality documents include:

- **IQ/OQ Documentation Only:** A documentation package used to qualify installation and operation of the sterilizer.
- **IQ/OQ Documentation and Execution:** A documentation package and manufacturer representative executing and qualifying installation and operation of the sterilizer.
- **GMP Documentation Package:** Good Manufacturers Practice documentation package used for sterilizers involved in the manufacturing process.
- **FAT (Factory Acceptance Test):** Equipment testing performed directly by the manufacturer in the factory before shipment.
- **FAT Documentation Only Package:** Documents qualifying the factory acceptance test.
- **SAT (Site Acceptance Test):** On-site testing of the equipment performed by a manufacturer's representative.
- **FRS (Functional Requirement Specification):** Testing provided ensuring equipment functionality.
- **Chamber Temperature Mapping:** Temperature testing throughout the inside of the chamber to record consistency.

### **Installation Scope**

All Beta Star sterilizers are installed directly by the manufacturer or an authorized service and installation provider. The scope of installation can vary depending on the customer's requirements.

- **Delivery:** Factory direct delivery and installation provided directly or through an authorized installation provider.
- **Removal of Existing Equipment:** In the case of equipment replacement, Beta Star can arrange removal of the existing sterilizer.
- **Installation Supervision Only:** Where in-house or specialized service workers will be used, an on-site authorized representative will guide workers through the installation process.
- **User Training:** Operator training is provided with every newly installed sterilizer. Additional operator training is available to refresh or train new users.
- **Maintenance Training:** In-house maintenance technicians can benefit from factory direct training on-site.

### **Preventative Maintenance**

A network of trained and skilled service technicians can provide scheduled inspections, adjustments, and recommended maintenance to ensure equipment reliability. Contact Beta Star Service for maintenance agreement options.

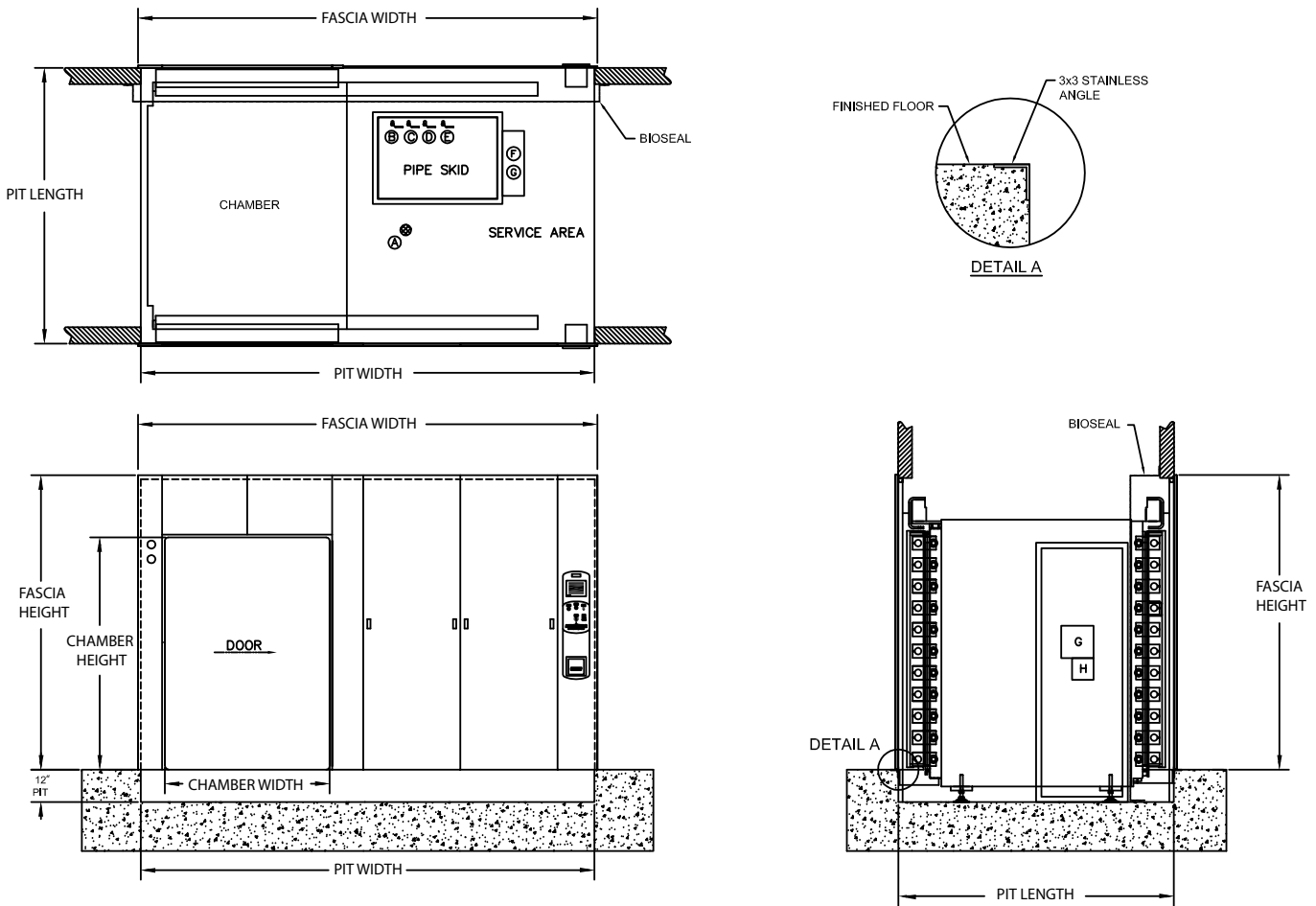
### **Water Conservation**

The EnviroVac® dramatically reduces environmental and facility water usage concerns with our water savings option.

## ENVIROVAC®

Beta Star Sterilizers can be equipped with the optional patent pending EnviroVac®. Designed to drastically reduce water consumption by nearly 75% during the sterilization cycle, the EnviroVac® requires only a 1/2" water feed at a minimum of 20 psig. With the EnviroVac® option your sterilization cycle is no longer at risk due to normal water pressure and temperature fluctuations. The EnviroVac® also monitors and regulates water and steam discharge to ensure they are below safe and regulatory temperature levels before allowing entry to the facility drain systems. This replaces standard vacuum pump and condenser systems provided by others. Condensers on other systems have a history of failure, which requires costly out of warranty replacement.

General Arrangement Shown



**Sizing**

Beta Star sterilizers are available in a variety of sizes to meet your process needs. Sizes are selected based on throughput, facility size, or existing equipment including equipment carts and isolated or ventilated cage systems.

See the chart below for a list of our standard sized sterilizers. Custom sizes are available upon request. Beta Star's sectioned sterilizer chambers are assembled on-site, where building access is limited in space.

Model	Chamber Size in Inches			Pit Width	Pit Length	Wall Height	Facia Width
	Width	Height	Length				
VR 355749	35	57	49	108	65	80	110
VR 355760	35	57	60	108	77	80	110
VR 355786	35	57	86	108	102	80	110
VR 495786	49	57	86	132	102	80	146
VR 368686	36	86	86	106	102	109	122
VR 498686	49	86	86	132	102	109	148
VR 618686	61	86	86	168	102	109	170
VR 728686	72	86	86	192	102	109	194

<b>Model Large Capacity Sterilizers</b>								
Plumbing Utility		PSIG	Pipe Material	Flow Rate	355749	355760	355786	495786
<b>A</b>	Drain Size		** By Others		4 inch	4 inch	4 inch	4 inch
<b>B</b>	Compressed Air (SCFM)	80-100	Copper	Size Line	1/2 inch	1/2 inch	1/2 inch	1/2 inch
				Peak/Avg	2/1	2/1	3/2	3/2
<b>C</b>	EnviroVac® Vacuum Cold Water (GPM)	40-60	Copper	Size Line	3/4 inch	3/4 inch	3/4 inch	3/4 inch
				Peak/Avg	7/4	7/4	7/4	7/4
<b>E</b>	House Steam (LB/HR)	60-80	BLK Iron / BR	Size Line	1-1/4 inch	1-1/4 inch	1-1/2 inch	1-1/2 inch
				Peak/Avg	490/335	560/380	690/460	880/570
Electrical Utility					355749	355760	355786	495786
<b>F</b>	Control		Voltage / Phase / Frequency		120 Volt / 1 / 60Hz			
			Amp Draw		1 Amp / Dedicated			
<b>I</b>	EnviroVac® System	208V/3Ph/60hz	Amp Draw / Disconnect		17.5	17.5	17.5	34
		480V/3Ph/60hz	Amp Draw / Disconnect		7.6	7.6	7.6	15
<b>J</b>	Air Compressor		Voltage / Phase / Frequency		120 Volt / 1 / 60 Hz			
			Amp Draw		12 Amp, Dedicated			

<b>Model Large Capacity Sterilizers</b>								
Plumbing Utility		PSIG	Pipe Material	Flow Rate	368686	498686	618686	728686
<b>A</b>	Drain Size		** By Others		4 inch	4 inch	4 inch	4 inch
<b>B</b>	Compressed Air (SCFM)	80-100	Copper	Size Line	1/2 inch	1/2 inch	1/2 inch	1/2 inch
				Peak/Avg	3/2	3/2	3/2	3/2
<b>C</b>	EnviroVac® Vacuum Cold Water (GPM)	40-60	Copper	Size Line	3/4 inch	3/4 inch	3/4 inch	3/4 inch
				Peak/Avg	15/7	15/7	15/7	15/7
<b>E</b>	House Steam (LB/HR)	60-80	BLK Iron / BR	Size Line	2 inch	2 inch	2 inch	2 inch
				Peak/Avg	1100/770	1310/840	1700/1095	1800/1240
Electrical Utility					368686	498686	618686	728686
<b>F</b>	Control		Voltage / Phase / Frequency		120 Volt / 1 / 60Hz			
			Amp Draw		1 Amp / Dedicated			
<b>I</b>	EnviroVac® System	208V/3Ph/60hz	Amp Draw / Disconnect		34	34	34	34
		480V/3Ph/60hz	Amp Draw / Disconnect		15	15	15	15
<b>J</b>	Air Compressor		Voltage / Phase / Frequency		120 Volt / 1 / 60 Hz			
			Amp Draw		12 Amp, Dedicated			

NOTE: Utility "letter" key in (**BOLD**), indicates standard equipment utility requirements.

\*\*Suitable for 140°F

Customer Information	
Company:	_____
Contact:	_____
Address:	_____
Building:	_____
City:	_____ State: ___ Zip: _____
Phone:	_____
Email:	_____
Project:	_____

Select your equipment configuration, features and options by using the check boxes below.

\* Required Selections

**Model Size\***

- 35x57x49 = 56.57 ft<sup>3</sup>
- 35x57x60 = 69.27 ft<sup>3</sup>
- 35x57x86 = 99.29 ft<sup>3</sup>
- 49x57x86 = 139 ft<sup>3</sup>
- 36x86x86 = 154.08 ft<sup>3</sup>
- 49x86x86 = 209.72 ft<sup>3</sup>
- 61x86x86 = 261.09 ft<sup>3</sup>
- 72x86x86 = 308.17 ft<sup>3</sup>
- Custom: \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_

**Door(s)\***

- Single Door
- Double Door

**Mounting\***

- Recessed One Wall
- Recessed Two Walls
- Free Standing (Cabinet)

**Cabinet Fascia Panels\***

- No Side Panels (Recessed)
- Modular Wall

**Service Side and Control Side\***

- Left Side Service
- Right Side Service

**Control Options\***

- Model LS PLC (Standard)
- Allen Bradley Compact Logix
- Partial Remote (For Double Door)
- Full Remote (For Double Door)
- Additional Printer (One Standard)
- Nema 4X Enclosure
- Foot Pedal for Door
- Dual RTD with Recorder

**Piping\***

- Copper and Brass (Standard)
- 316L Threaded and Swagelock
- 316L Sanitary

**Compressed Air\***

- House Air
- Integral Air Compressor

**Vacuum System Type\***

- EnviroVac® Water Conservation Vacuum System

**Steam Source\***

- House Steam
- House Clean Steam
- Steam to Steam Generator (Single Tube)
- Steam to Steam Generator (Double Tube)

**Cart & Carriage Options**

- Loading Cart with Two Shelves
- Cart Drip Pan

**Vessel & Jacket Options**

- Additional 1.5" Threaded Side Port
- Additional 1.5" Sanitary Side Port
- Polished 20 Ra. (25 Ra. Standard)
- Polished 10 Ra. (25 Ra. Standard)
- Internal Chamber Passivation
- 316L Steam Jacket (304 Standard)
- Seismic Restraints
- Sanitary Thermocouple Fitting

**Process Feature Options**

- Load Probe for F<sub>0</sub>
- Air Inlet, Insitu Filter
- Stainless Air Inlet Housing
- Air Over Pressure

**Containment Options**

- Effluent Decontamination Package
- Door 1 Bioseal
- Door 2 Bioseal
- Dual Bioseal

**Quality and Documentation Options**

- IQ/OQ Documentation Only
- IQ/OQ Documentation and Execution
- GMP Documentation Package
- FAT (Factory Acceptance Test)
- FAT Documentation Only Package
- SAT (Site Acceptance Test)
- FRS (Functional Requirement Specification)
- Chamber Temperature Mapping

**Installation Scope\***

- Delivery and Installation
- Removal of Existing Equipment
- Installation Supervision Only
- User Training
- Maintenance Training
- Validation Support
- Rigging