

APPLICATION

Two configurations are available for sterilization of certain materials used in healthcare facilities.

- **Gravity** – designed for sterilization of liquids in flasks with vented closures, at 250°F (121°C), and also heat- and moisture-stabile goods at 270°F (132°C).
- **Prevacuum** – designed for efficient, high-volume processing of heat- and moisture-stabile materials, such as fabrics, wrapped hard goods, glassware or animal bedding, at 270°F (132°C). Prevacuum units will also run gravity-type cycles.

Gravity units operate by the gravity downward displacement air-removal principle. **Prevacuum** sterilizers have a chamber evacuation system for high-speed, high-volume sterilization. Both types use steam-under-pressure as the sterilizing agent. Sterilizers are available for connection to building steam supply, or with an integral electric steam generator*.

* Except 16 x 16 x 26" double door sterilizers.

DESCRIPTION

Amsco Remanufactured Small Sterilizers consist of new piping and



(Typical only – some details may vary.)

control components, and a completely renovated pressure chamber and door(s). Sterilizers feature an advanced microcomputer control system, providing the latest standard for cycle setup, selection and monitoring. Once settings are made and cycle started, microcomputers accurately monitor and control system operations. Control column includes an easy-to-read vacuum fluorescent display and an integral thermal printer.

Interior Chamber Dimensions

Both Gravity and Prevacuum units come in two sizes, with interior dimensions of:

- 16 x 16 x 26" (406 x 406 x 660 mm)
- 20 x 20 x 38" (508 x 508 x 965 mm).

Offering includes choice of single-door (cabinet enclosed or recessed) or double-door (recessed through one or two** walls) units.

** 20 x 20 x 38" (508 x 508 x 965 mm) sterilizers only (16 x 16" [406 x 406 mm] through modular walls only).

The Selections Checked Below Apply To This Equipment

TYPE/SIZE

- 3011: Gravity, 16 x 16 x 26" (406 x 406 x 660 mm)
- 3021: Gravity, 20 x 20 x 38" (508 x 508 x 965 mm)
- 3013: Prevacuum, 16 x 16 x 26" (406 x 406 x 660 mm)
- 3023: Prevacuum, 20 x 20 x 38" (508 x 508 x 965 mm)

DOORS

- Single
 - Door Hinge**
 - On Right Side
 - On Left Side
- Double
 - Door Hinge (Operating End First)**
 - Right Side/Left Side
 - Right Side/Right Side
 - Left Side/Right Side
 - Left Side/Left Side

SINGLE DOOR MOUNTING

- For Recessing
- Cabinet Enclosed

DOUBLE DOOR MOUNTING

- For Recessing Through One Wall
- For Recessing Through Two Walls (20 x 20 x 38" [508 x 508 x 965 mm] sterilizers only)

STEAM SOURCE

- Building Steam
- Electric Steam*
 - 208/240 Volts
 - 480 Volts

MATERIAL HANDLING ACCESSORIES**

- Rack and Shelves
- Surgical Instrument Trays
- Loading Car and Carriage (20 x 20 x 38" [508 x 508 x 965 mm] sterilizers only)

* 16 x 16 x 26" (406 x 406 x 660 mm) double door sterilizers are not available with electric steam generator.

** See separate product literature for details.

Item _____
 Location(s) _____

STANDARDS

Each sterilizer meets applicable requirements of the following listings and standards, and carries the appropriate symbols:

- **Underwriters Laboratories (UL) Standard 544** as certified by ETL Testing Laboratories, Inc.
- **Canadian Standards Association (CSA) Standard C22.2 No. 125.**
- **ASME Code, Section VIII, Division 1** for unfired pressure vessels. The pressure vessel is so stamped; ASME Form R-1 is furnished. Shell and door are designed for maximum allowable working pressure of 42 psig (289.6 kPa) for 16 x 16 x 26" (406 x 406 x 660 mm) sterilizers and 40 psig (275.8 kPa) for 20 x 20 x 38" (508 x 508 x 965 mm) sterilizers.
- **ASME Code, Section I, Part PMB**, for power boilers, if optional steam generator is supplied.
- **Seismic Pre-approval R-0282.**

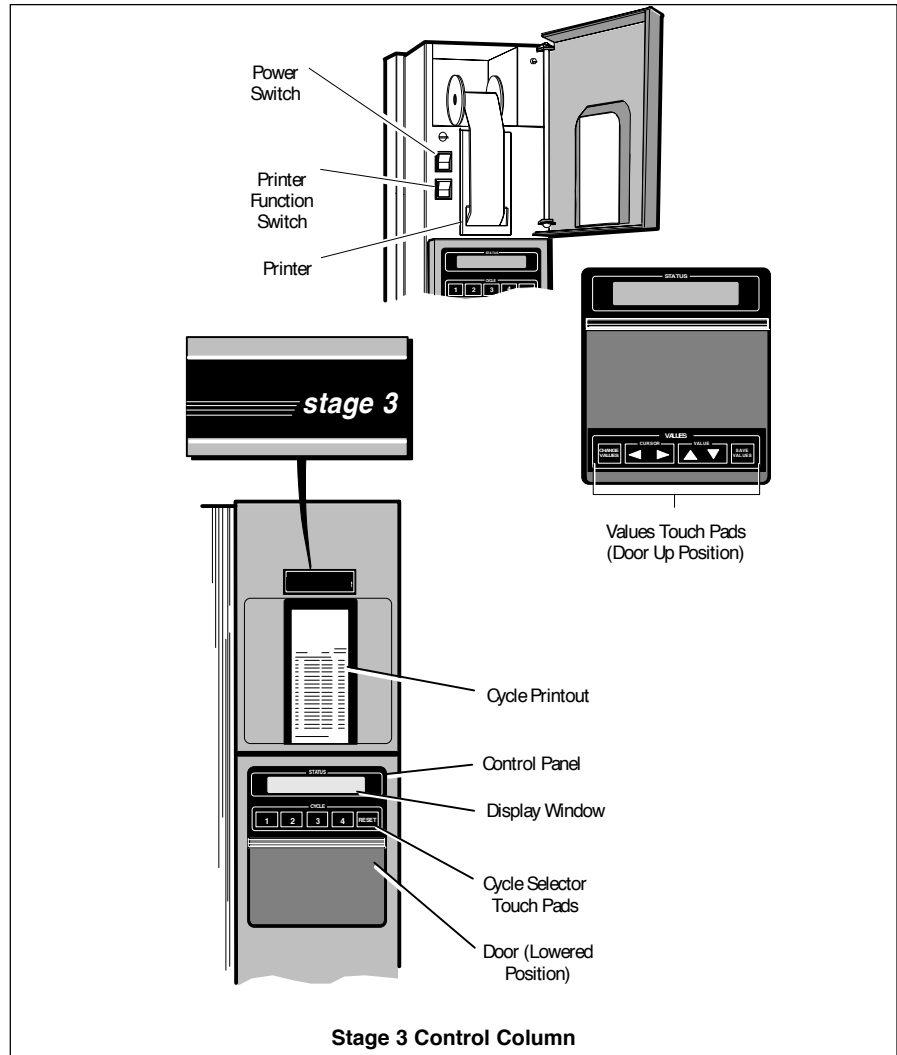
CONTROL SYSTEM

Design Features

Stage 3 Control System monitors and controls all sterilizer operations and functions. Cycle progresses automatically through conditioning, sterilizing, exhaust (fast or, for liquids, adjustable-slow with accelerator) and drying phases. Control indicates cycle completion visually and also audibly for 90 seconds. At end of cycle, timers reset to the previously selected values, eliminating the need to reset values between repeated cycles. Timers reset if sterilize temperature drops 2°F (1.1°C) below set point.

A vertical column, mounted on side opposite door hinge, houses the controls. Side-mounting makes controls easy to access – and it removes them from exposure to the continuous heat, vapor and condensate resulting from the sterilization process. Salient features include:

1. **Hinged door at the top of control column** which provides access to:
 - **Control Power Switch** – controls power to the sterilizer control.



- **Printer Function Switch** – controls two printer functions:
 - » **Duplicate Print** – pressing top of printer switch generates a complete duplicate printout of either the last completed cycle (when unit is not in cycle), or the current cycle phase and conditions (when unit is in cycle). First line of duplicate printout always indicates DUPLICATE PRINT.
 - » **Print Values** – pressing bottom of printer switch generates a printout of all currently set cycles and cycle values.
- **Thermal Printer** – provides an easy-to-read printed record of all pertinent cycle data. The operator can easily verify that the cycle parameters are being met. Computer-generated printouts include date, daily cycle number, starting time of each cycle, temperature selected, key transition points in cycle, and any deviations which might jeopardize the sterilization process. Printer take-up spool automatically stores an entire roll of paper, providing cycle records which can be saved for future reference.
- 2. **Control panel** with display window and two rows of touch pads. Touch pads are accessed by raising or lowering a sliding door, preventing inadvertent cycle starts or changes.
 - **Display Window** – features a 2-line x 20-character vacuum fluorescent display. It shows sterilizer status, time (time of day, sterilize time and dry time), temperature, pressure, warnings and instructional messages.

Display also indicates any abnormal conditions that may exist either when in the READY mode or when a cycle is in progress. All messages are complete readouts with no codes to be cross-referenced.

- **Values Touch Pads** – modify cycle values. Sterilize Time and Temperature, and Dry Time values for each cycle can be modified by using CHANGE VALUES touch pads. Cycle values are locked in and cannot be changed once cycle is started.
- **Cycle Selector Touch Pads** – (Gravity and Liquids for Gravity sterilizers; Gravity, Liquids and Prevac for Prevacuum sterilizers) start previously programmed cycles. Operator must press pad twice to initiate a cycle, minimizing chances of incorrect cycle selection. Cycle does not start unless chamber door is locked. Display shows selected cycle and sterilizer conditions immediately when cycle begins.
- **Reset Touch Pad** – resets control in case incorrect cycle is started.
- **Non-Operating End (NOE) Controls** – equipped on double-door sterilizers only, include Cycle Selector Touch Pads, by which previously set cycles can be repeated, RESET Touch Pad and a Display Window. Display window is the same as the operating-end display window and concurrently shows the same messages.
- All sterilizers provide a service-technician-initiated **Field Self-Test mode** for expedited troubleshooting in the event of a malfunction.

3. **Touch pad-selectable features/functions** – control system allows selection of additional features through the control panel. Some features, as noted, can only be adjusted by a trained technician.

- **Printer Output and Display Window Information** – layout allows selection of displays and printouts in English, French or Spanish (using standard English characters).
- **Temperature Display and Printout Units** – allows selection of either Fahrenheit (°F) or Celsius (°C). Temperature is set, controlled and displayed to the nearest degree. (Selection can be changed only by a trained service technician.)
- **Pressure/Vacuum Display and Printout Units** – allows selection of either PSIG/In Hg or bar (a metric measurement for scientific use). (Selection can be changed only by a trained service technician.)
- **Date and Time** – permits change of date and time.

Technical Data

Control system consists of microcomputer control boards and peripheral function circuit boards, located in the control housing behind the control column front panel.

An **internal battery** backs up all cycle memory. If there is a power failure during a cycle, the battery back-up system ensures that (1) proper cycle completion can still occur, and (2) cycle memory will be retained. When power is lost, the cycle is held in phase

until power is restored, thus exceeding the minimum government specification of one minute. Once power returns, the event is recorded on the printout and the cycle resumes or restarts, depending on what phase the cycle was in at the time of power loss. Even if the RAM battery should fail, factory default values will be preserved in the control's main EPROM chip.

Control board circuits monitor sterilizer functions and include an A/D converter, a watchdog timer to protect AC output, and an on-board power supply circuit. Quartz crystals maintain precision timing. A resistive thermal detector RTD senses temperature, and a strain-gauge-type pressure transducer senses pressure. These signals, converted into electrical impulses, provide accurate control inputs and readouts throughout the entire cycle. Temperature- and/or pressure-sensor failures sound an alarm and message is printed.

Printer board has a 24-column digital alphanumeric printer which produces characters within a five-by-seven dot matrix on 2-1/4" wide, single-ply thermal paper. Printer is controlled by a dedicated microcomputer. Print speed is approximately 48 lines per minute. Paper tape exits from an opening flush with the surface of the control panel and it is taken up automatically by an idler spool mounted above the main printer assembly. An entire roll of paper can be stored on the take-up spool. Data is automatically printed at the beginning and end of each cycle and at all transition points. Five paper tape rolls are furnished with each unit.

CHARGE	T = 78 F P = 0 PSIG
STERILIZE 2:43	T = 272 F P = 30 PSIG
FAST EXHAUST	T = 221 F P = 1 PSIG

SLOW EXHAUST	T = 184 F P = 0 PSIG
WARNING HOT LIQUIDS	T = 118 F P = 0 PSIG
INVALID VALUE SET SEE OPERATOR MANUAL	

Control Monitoring and Communication

Sterilizer operates on 120 VAC, 50/60 Hz, 1-Phase electrical **power service**. Internal power supply provides regulated voltage levels for display, printer, take-up motor, analog circuits, and digital circuits. Solenoid valves operate on 120 VAC. An additional 208-240 or 480 Volt service is required if unit has an optional steam generator.

CONSTRUCTION

Jacket and Chamber Assembly

Nickel alloy door frames support and conceal ends of door-holding arms when doors are locked, presenting a smooth surface for door gasket contact.

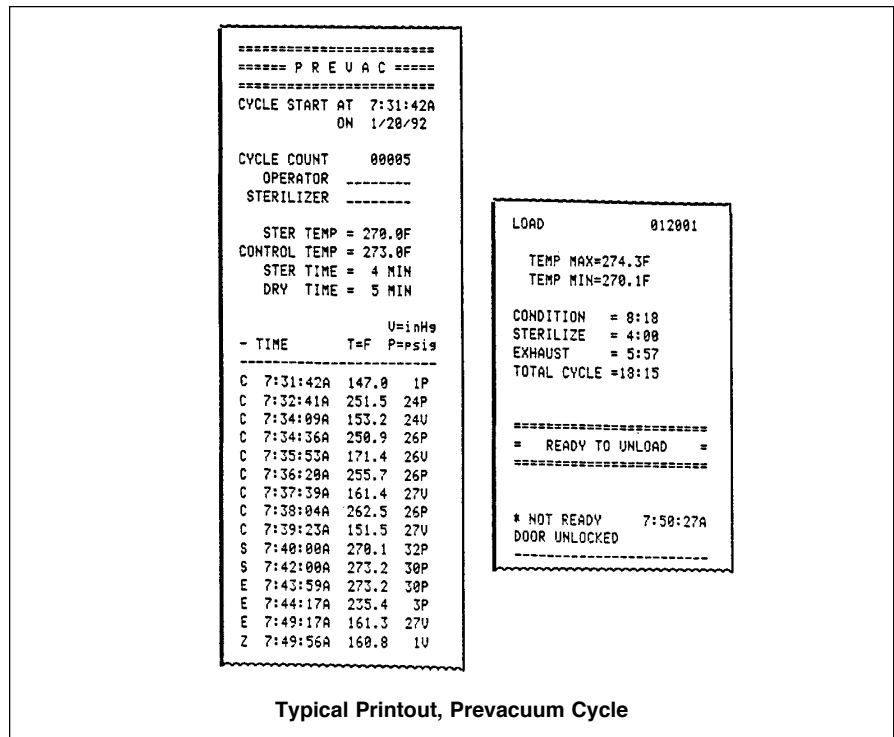
Hot-rolled carbon-steel shells, welded one within the other, form the sterilizer steam jacket. The inside of inner shell is nickel-clad, 0.025" (0.63 mm) thick (nominal). A chamber test opening (plugged) is provided.

Glass-fiber blanket insulation on outside of chamber assembly is 1" (25 mm) thick (nominal), and is double-faced with aluminum foil. It is held in place by pressure-sensitive tape, aluminum straps and clips. Sterilizer jacket is painted prior to being insulated. Steam-supply opening inside chamber is shielded by a baffle.

Chamber Door(s)

Door is cast-bronze and manually operated. Its stainless-steel, bearing-mounted hinges will be on side of chamber specified. Hinges are adjustable for accurate gasket alignment. Radial arms, actuated by rotating a low-heat-conducting handwheel, exert an even pressure on the silicone-rubber sealing gasket. Gasket is replaceable without tools.

A stainless-steel, sound-deadening cover conceals radial arms and exterior parts. Microswitches prevent inadvertent start of cycle before radial arms are engaged; pressure lock(s) keeps door(s) from being opened during cycle. Door(s) may be tightened but not opened while pressure is in chamber.



Typical Printout, Prevacuum Cycle

Vacuum System (Prevacuum Sterilizers Only)

Prevacuum – A series of microcomputer-controlled and monitored vacuum/pressure pulses effectively condition loads of various size and density, reducing total sterilization time. Factory setting consists of three pressure pulses and four evacuations. Evacuation system includes a water ejector.

Post-vacuum (Drying) – Following the exposure phase, chamber is exhausted and evacuation continues throughout the drying phase. At conclusion of drying phase, filtered air relieves the vacuum. Air filter is bacteria retentive.

Chamber Drain System

Drain system is designed to prevent pollutants from entering into the water-supply system. Steam-condensate system with water saver converts steam to condensate and disposes condensate to waste. Water flow is regulated consistent with the amount of steam discharged. Water supply shutoff valve is behind upper access door. A constant steam bleed across a temperature-sensing element (RTD) in the chamber drain line provides

improved air elimination and more accurate temperature sensing.

Steam Source

Sterilizers are piped, valved and trapped to receive steam delivered at 50 to 80 psig (344.7 to 551.6 kPa). Sterilizer service lines terminate at fittings for connection to building service lines. Sterilizer steam supply line includes a strainer, shutoff and internal pressure regulator. Jacket condensate line includes a strainer, trap, and check valve. Shutoff valve, jacket pressure and chamber pressure/vacuum gauges are mounted in the valve panel, behind the upper access door. Scales are graduated in both English and metric.

Optional Integral Steam Generator

Steam generator is electrically powered, automatically filled with water, and operates whenever sterilizer power is on. Includes positive displacement water pump powered by a continuous-duty motor. Generator is serviceable from front of sterilizer. Feedwater line (hot or cold) has a strainer and vacuum breaker; a valve is provided for manually draining the generator.

Generator automatically supplies steam. Heaters operate on 208-240 V or 480 V, 50/60 Hz, 3-Phase electric power. Additional voltages are available upon request. Nominal capacity of the generator heaters is 30 kw, when operated at 240 V. Capacity is approximately 22.5 kw when operated at 208 V. Controls operate on 120 V, 50/60 Hz, 1-Phase electric power.

Other Components

The following are furnished to provide a complete working unit, ready for (but not including) connection to the building utility service lines.

- **Solenoid Valves** to simplify sterilizer piping. Valves are placed where needed and can be serviced individually.
- **Manual Valves** are bronze body, ball type with stainless-steel ball and stem. Seat and seal are constructed of reinforced TFE. They are pressure rated at 125 psig (862 kPa) for saturated steam. Valve handles are low-heat conducting and easily replaceable.
- **Steam Pressure Regulator** operates on supply pressure of 50 to 80 psig (344.7 to 551.6 kPa). Secondary pressure is adjustable and controlled by a phosphor-bronze, spring-loaded bellows. Adjustable stops are factory set for sterilizer operation at either 253° or 273°F (122° or 134°C). Pressure regulator can be adjusted by a technician to run cycles at any temperature between 212° to 280°F (100° to 138°C).

- **Thermostatic Steam Traps** are pressure and temperature compensated and have renewable monel bellows with matched stainless-steel plunger and seat.

All **piping and electrical connections** terminate within the confines of the sterilizer. Piping used to support other components is rigid brass.

Water sensing system is designed to shut down steam supply to the sterilizer if water accumulation is detected in the chamber.

ACCESSORIES

Material handling accessories available include racks with shelves, instrument trays and loading cars (except for 16 x 16 x 26" [406 x 406 x 660 mm] units) – all constructed of nickel alloy; with carriages of stainless-steel. See separate product literature for details.

INSTALLATION

Sterilizers are arranged for mounting as either cabinet-enclosed or recessed, as specified. Each sterilizer is equipped with a height-adjustable,

steel floor stand with cadmium-plated pads and leveling screws. Sterilizer subframe has a synthetic-rubber gasket to ensure tight fit of cabinet panels to each other (freestanding units), or front panel to wall partition (recessed units). Stainless-steel front panel has service access door and height-adjustable kickplate. On freestanding units, stainless-steel side panels and a louvered top panel enclose the sterilizer body and piping.

PREVENTIVE MAINTENANCE

A global network of skilled service specialists can provide periodic inspections and adjustments to assure low-cost peak performance. STERIS representatives can provide information regarding Annual Maintenance Agreements.

NOTES

1. Pipe sizes shown indicate terminal outlets only. Building service lines, provided by others, must supply the specified pressures and flow rates.
2. Disconnect switches (with OFF position lockout; by others) should be installed in electric supply lines near the equipment.
3. Access to the recessing area from the control end of the sterilizer is recommended.
4. Clearances shown are minimal for installing and servicing the equipment.
5. If loading car and carriage are to be used with a 20 x 20 x 38" (508 x 508 x 965 mm) sterilizer, front clearance should equal twice the length of the sterilizer. This will permit complete withdrawal of the loading car from the chamber and allow convenient maneuverability of the transfer assembly to and from the sterilizer.
6. Right-side door-swing clearances are shown. Clearances for left-side door swing are identical.
7. Floor drain should be provided within confines of sterilizer framework.

UTILITY REQUIREMENTS

Cold Water (CW)

1" NPT; 80° F (26.7° C) maximum; recommended total hardness should be 3-8 grains, specific resistance not to exceed 26,000 ohms/cm (conductivity of not less than 38.5 micromhos), with pH maintained between 6.8 to 7.5. Total dissolved solids should not exceed 500 ppm and alkalinity (bicarbonate only) should not exceed 250 ppm as calcium carbonate.

Gravity Sterilizers – 20 to 50 dynamic psig (137.9-344.7 kPa).

Prevacuum Sterilizers – 30 to 50 dynamic psig (206.8-344.7 kPa).

Drain (D)

1-1/2" ODT drain terminal. (Floor drain capacity must handle peak water consumption.)

Drain for Generator (DG) (Electric Units only)

1/2" ODT.

Steam (S) (Steam Units only)

1/2" NPT; 50 to 80 psig (344.7-551.6 kPa) dynamic; 97-100% vapor quality.

Hot Water (HW) (Electric Units only)

1/2" NPT; 20 to 50 psig (137.9-344.7 kPa) dynamic; recommended total hardness should be 3-8 grains, specific resistance not to exceed 26,000 ohms/cm (conductivity of not less than 38.5 micromhos), with pH maintained between 6.8 to 7.5. Total dissolved solids should not exceed 500 ppm and alkalinity (bicarbonate only) should not exceed 250 ppm as calcium carbonate.

NOTE: Cold water may be substituted but with a sacrifice on heat-up time!

Electricity (E)

120 V, 50/60 Hz, 1 A for sterilizer controls (7 A if electric generator).

Electricity for Generator Heaters (GE) (Electric Units only)

208/240 V, 50/60 Hz, 3-Phase, 62.6/72.2 A; or 480 V, 50/60 Hz, 3-Phase, 37 A.

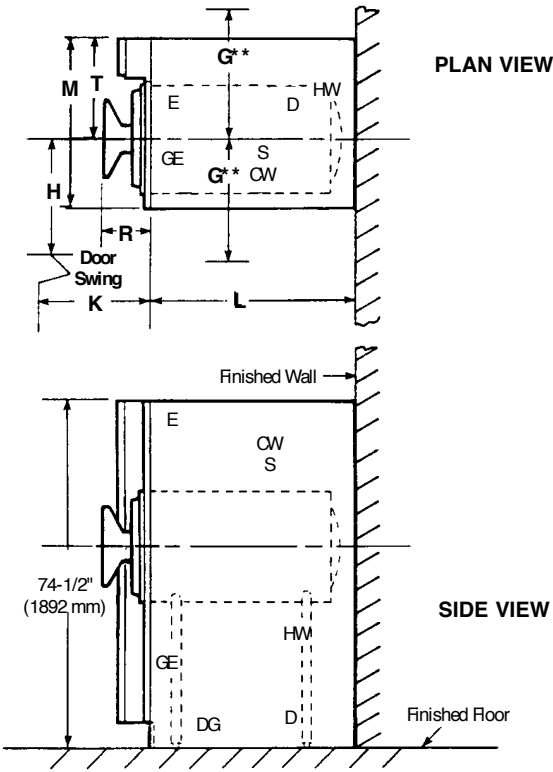
... CHECK LOCAL CODES ...

	CHAMBER SIZES	
	16 x 16 x 26" (406 x 406 x 660 mm)	20 x 20 x 38" (508 x 508 x 965 mm)
G	30" (762 mm)	32" (813 mm)
H	23" (584 mm)	25" (635 mm)
J	25" (635 mm)**	27" (686 mm)**
K	22" (559 mm)	27" (686 mm)
L	28-1/4" (718 mm)	40-1/4" (1022 mm)
M	31-1/2" (800 mm)	35-1/2" (902 mm)
N	40" (1016 mm)**	52" (1321 mm)**
P	24-1/8" (613 mm)	28-1/8" (714 mm)
R	10-1/4" (260 mm)	10-1/4" (260 mm)
T	18-1/2" (470 mm)	20-1/2" (521 mm)
U	12" (305 mm)	15" (381 mm)
V	26" (660 mm)	30" (762 mm)
X	69-7/16" (1764 mm)	90-3/8" (2296 mm)

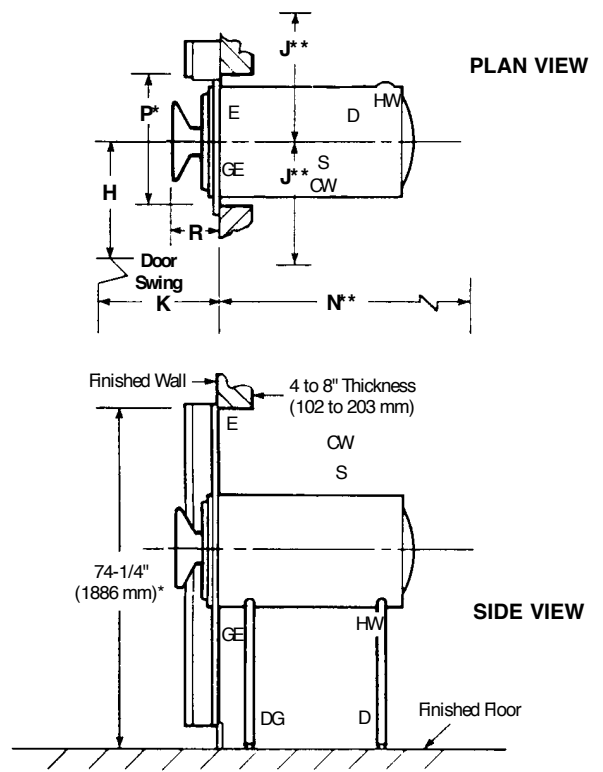
* Wall Opening

** Minimum Service Clearance

Cabinet Enclosed

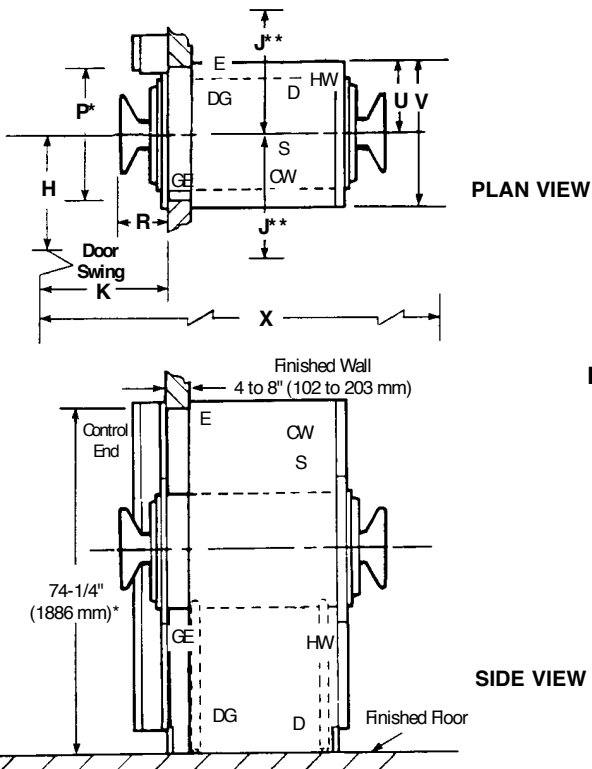


For Recessing (See Note 3)

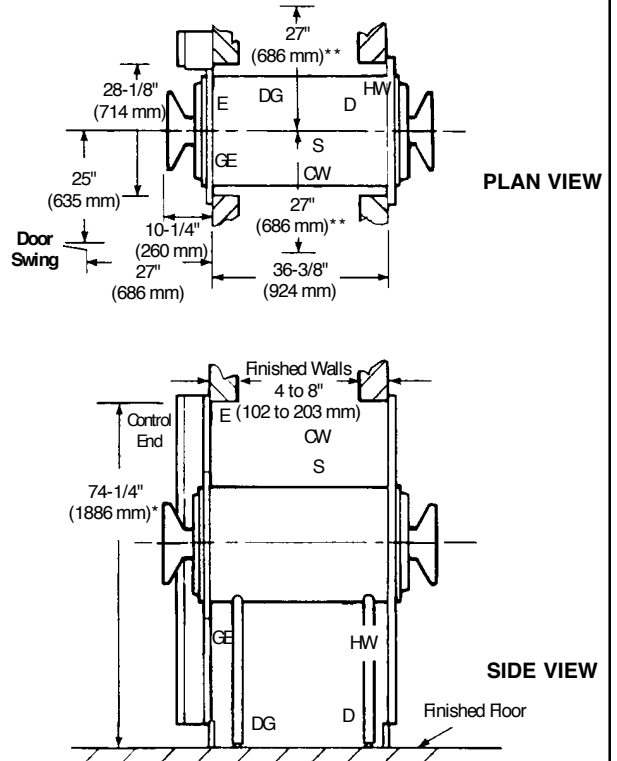


SINGLE DOOR

For Recessing Thru One Partition Wall



For Recessing Thru Two Partition Walls (20 x 20 x 38" [508 x 508 x 965 mm] Sterilizer Only)



DOUBLE DOOR

NOTE: Because of STERIS's continuing program of research and development, all specifications and descriptions are subject to change without notice. Some options may affect utility consumptions. Obtain approved drawings for design, and installation.

ENGINEERING DATA

Unit Size inches (mm)	Maximum Operating Weight ¹ lbs (kg)	Cold Water Consumption				Hot Water Consumption ²				Steam Consumption			
		Gravity Units		Prevacuum Units		Gravity Units		Prevacuum Units		Gravity Units lb/hr (kg/h)		Prevacuum Units lb/hr (kg/h)	
		Peak	Average	Peak	Average	Peak	Average	Peak	Average	Peak	Average	Peak	Average
16 x 16 x 26 (406 x 406 x 660)	1410 (640)	5 gpm (19 lpm)	98 gph (371 lph)	15 gpm (57 lpm)	164 gph (621 lph)	12 gph (45 lph)	4 gph (15 lph)	12 gph (45 lph)	10 gph (38 lph)	83 (38)	35 (16)	83 (38)	70 (32)
20 x 20 x 38 (508 x 508 x 965)	2128 (965)	5 gpm (19 lpm)	98 gph (371 lph)	15 gpm (57 lpm)	164 gph (621 lph)	16 gph (61 lph)	8 gph (30 lph)	16 gph (61 lph)	14 gph (53 lph)	116 (53)	49 (22)	116 (53)	98 (44)

Unit Size Inches (mm)	Heat Loss ³ : Steam Heat							Heat Loss ³ : Steam Heat						
	Single Door Cabinet Enclosed	Single Door Recessed		Double Door Recessed One Wall		Double Door Recessed Two Walls		Single Door Cabinet Enclosed	Single Door Recessed		Double Door Recessed One Wall		Double Door Recessed Two Walls	
		Front of Wall	Back of Wall	Front of Wall	Back of Wall	At Each End	Between Walls		Front of Wall	Back of Wall	Front of Wall	Back of Wall	At Each End	Between Walls
16 x 16 x 26 (406 x 406 x 660)	4300 (4537)	1600 (1688)	2700 (2849)	1600 (1688)	3500 (3693)	-	-	4300 (4537)	2300 (2427)	3750 (3956)	-	-	-	-
20 x 20 x 38 (508 x 508 x 965)	7000 (7385)	2500 (2638)	4500 (4748)	2500 (2638)	5300 (5592)	2500 (2638)	2800 (2954)	8750 (9231)	3300 (3482)	5450 (5750)	3300 (3482)	6250 (6594)	3300 (3482)	2950 (3112)

¹ Based on seismic calculations.

² Hot water recommended for electrically powered units.

³ At 70°F (21°C).

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