

Sterilizers, Dryers, and Pharmaceutical Ovens



Gruenberg



Working into the wee hours of the night was never a problem when Gruenberg developed his first drying ovens. Nor is it today. Dedication to new approaches remains a corporate passion.



Gruenberg

Gruenberg

Proven technology

Since 1932, Gruenberg has designed and manufactured high quality custom and standard pharmaceutical sterilizers, dryers and continuous process ovens.

Today, pursuing a philosophy of uncompromising performance, Gruenberg has emerged as a leader in the manufacturing of Class 100 and heat processing equipment worldwide, including isolators, barrier systems, clean room ovens and chilling tunnels.

ISO 9001 Certified

The Gruenberg quality system is certified to the prestigious ISO-9001 quality standard. Not surprising:

Gruenberg employees have always used a progressive quality system to verify each stage of construction. And, Gruenberg continues to research and test components and designs to improve performance. We are dedicated to bringing you the latest in technology, performance, and reliability. Quality control is the critical path in the manufacture of Gruenberg pharmaceutical equipment.

Choose contemporary design without sacrificing old-world craftsmanship and attention to detail.



Full touch screen programming and monitoring



Chilling tunnels for hot-fill are an additional product, as are a number of continuous conditioning systems.

Consider the fact that you can often get a custom oven designed and built by Gruenberg for what others charge for an off-the-shelf machine.

Over the years, Gruenberg has evolved as a premier builder of customer-specific applications. Our experience in designing custom systems translates into reasonable prices.

The result is a superior piece of equipment that gives more material content, more long-term reliability, and more satisfaction.

Gruenberg enjoys one of the highest customer retention rates of any pharmaceutical oven manufacturer in the world by offering comprehensive proposals, realistic schedules, and timely deliveries. Effective service before, during, and after every purchase has earned Gruenberg an extensive list of satisfied customers.

Exceptional craftsmanship, proven reliability and durability, and complete build-to-order capability are just a few of the reasons to specify Gruenberg.

When no off-the-shelf parts are available in stainless steel, Gruenberg machines their own, as with these door latches.



Or note the fully-adjustable hinge blocks, machined from a block of 304 stainless steel.



Radius corners and slope-to-drain are combined in this particularly challenging fabrication task.



Gruenberg uses fully welded heater tubes to keep all electrical connections exterior to the chamber.



Even belt guards are routinely fabricated from stainless steel.



We machine stainless steel casters here because no one else makes them. (Makes you wonder what the other guys use.)





Hot Air Sterilizers/Depyrogenation Ovens

Laboratory, Cabinet, Truck In

Whether standard or custom, every sterilizer provides simple operation, precise control, and even heat distribution. Flexibility in options allows a custom unit to be built for standard prices.

CONSTRUCTION

Though flexible in design, Gruenberg sterilizers are rigid where it counts: in construction. All units are built around a welded structural steel frame for long term durability. No panel joints are used. Instead, a unitized

construction is incorporated to prevent heat loss and contamination. Between the inner and outer walls, 4" of high performance insulation helps retain heat.

The exterior of the oven is constructed of 16 and 18 gauge 304 stainless steel with a #4 polish to withstand frequent washdowns. The interior is constructed of 304L, or if required, 316L. All interior seams are sealed by continuous heliarc welding.

Interior 3/4" radius corners are optional, along with other grades of stainless and finishes up to #8.

TEMPERATURE UNIFORMITY

Standard sterilizers are rated for 250°C depyrogenation. Multiple heater banks are designed to bring the load to sterilization temperature quickly and hold it economically. A digital proportioning controller will hold the temperature with a uniformity of $\pm 5^\circ\text{C}$. That's 10°C tighter uniformity than the generally accepted CGMP of $\pm 15^\circ\text{C}$.

AIRFLOW

A high volume horizontal airflow is used for superior temperature uniformity. Sterilizers are only shipped after the airflow tolerances have been finely tuned and checked by a multi-point uniformity test that samples a minimum of 12 points within the chamber. Gruenberg uses a distinct perforated side wall that allows fine tuning of the airflow.

FILTRATION

To keep the process chamber at class 100 quality, HEPA filters are installed on the air intake, the exhaust and in the recirculation wall.



Shown here is the non-sterile side of a typical truck-in sterilizer. Two removable truck tracks on the process chamber floor allow easy cleaning. Between the two truck tracks are steel pegs. The steel pegs lock the transfer cart and sterilizer together while loading the truck into the process chamber.

The HEPA filters are a minimum 99.97% efficient at 0.3 microns. The intake HEPA filter prevents contaminants from entering the sterilizer during operation. The exhaust HEPA filter ensures that contamination will not be drawn into the sterilizer as the cycle ends.

Side wall filters provide distinct advantages. Filtration takes place just before the air enters the sterilization chamber so that class 100 conditions are ensured. Plus, they afford easy access to filters for validation and maintenance.

ADDITIONAL FEATURES

Most sterilizers are designed for pass-through operation and are installed between sterile and non-sterile classified areas. An automatic door interlock system prevents unloading until the sterilizing and cooling cycles have been completed. Forced cooling helps shorten the cool-down period.

The door and loading tracks are elevated so that a proper seal can be made at the bottom of the door. Wiper gaskets are not recommended because they can sweep particles into the sterilizer.

Each sterilizer is designed for easy use and maintenance.

Side walls and loading tracks are easily removable for cleaning. The entire door seals against a continuous, silicone P-gasket.

216 ft³ custom, flush front sterilizer featuring a fully-automatic, pneumatically-powered door interlock mechanism that incorporates a hidden latch system.



70ft³ standard sterilizer



Hot Air Sterilizers/Depyrogenation Ovens



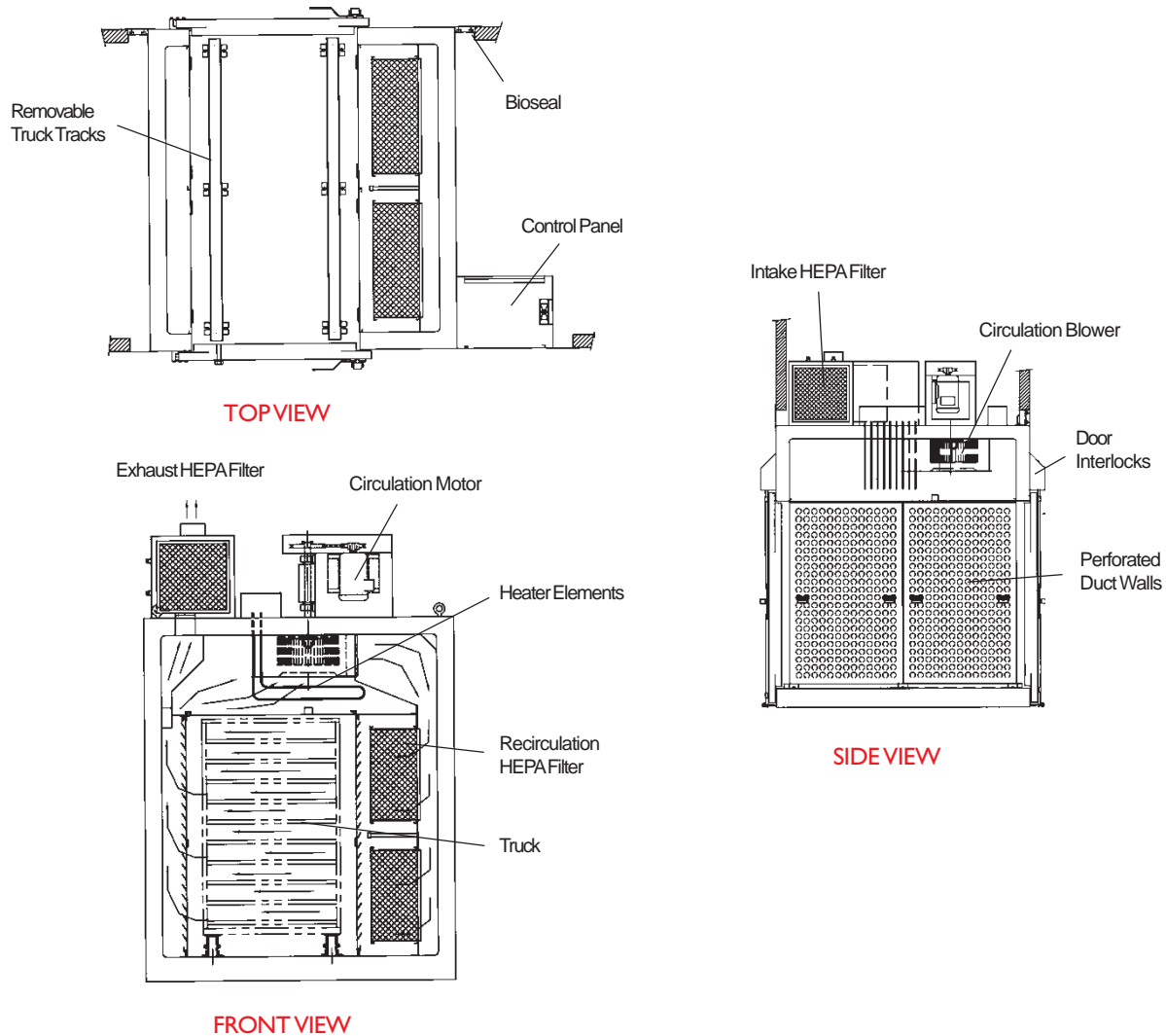
Controls

Gruenberg offers a broad selection of controls and control systems. A typical control panel is shown on this page. Additional controls are described in the option section on page 12. The control panels can be mounted on the sterilizer or in a remote console.

- 1 Magnehelic or Photohelic Gauges** - Pressure differential indication is provided from our four locations: circulation filters, chamber, intake filter, and exhaust filter.
- 2 Chart Recorder** - Solid state electronic single-pen recorder is available with either 24-hour or 7-day recording and has a 10" diameter circular chart and inkless pen. The recorder system comes with a thermocouple temperature sensor accurate to within .5% of range scale.
- 3 Programmable Temperature Controller: Multi-Segment** - The programmable temperature controller with digital set, digital readout, and thermocouple sensor can function as a normal process control or execute any of eight setpoint profiles. Each profile can have six ramp and six soak segments. Any number of profiles can be linked together. Accuracy: ± 0.25 of scale range.
- 4 High-Limit Thermostat** - The high limit thermostat has a user-defined preset limit. If the process temperature reaches that preset limit, the high-limit thermostat will de-energize the heating system. To reactivate heating, the high-limit thermostat must be reset manually.
- 5 Main Power Disconnect Switch** - For safe electrical maintenance of the unit, a main power disconnect switch is installed on the access door of the control box. This necessitates the power to be disconnected before allowing the panel to be opened. Disconnects can be fused or non-fused and a circuit breaker may be specified, too.
- 6 Power Switch** - Turns the power on or off.
- 7 Heat Switch** - Turns heating elements on or off.
- 8 Alarm Silence** - Turns off the alarm when alarm is activated.
- 9 Audible Alarm** - Signifies a system malfunction.
- 10 Indication Lights** - Provide information on the status of the process or if a problem should occur. Many configurations are available.
- 11 Ammeters** - Three ammeters, one for each phase, are provided so that the heater banks can be easily monitored. If even a single heater should burn out, the loss will be indicated on the appropriate ammeter.



Hot Air Sterilizers/Depyrogenation Ovens



Standard Features at a Glance

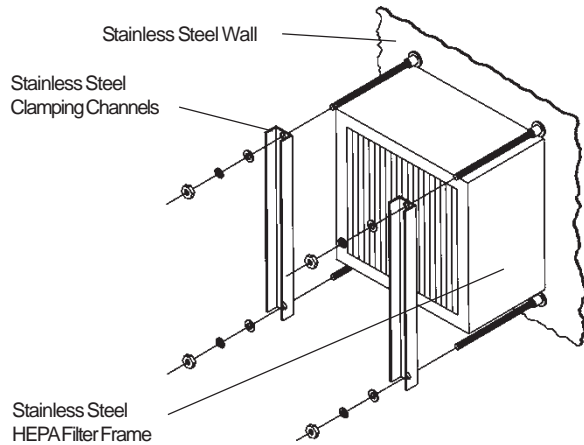
Frame:	Unitized construction for durability and handling (heavy-duty structural steel framework)	Airflow:	Horizontal for superior uniformity
Exterior:	Stainless steel type 304 with a #4 finish	Prefilter:	On air intake, 40% efficient
Interior:	Stainless steel type 304L with a 2-B finish and a continuously welded liner.	HEPA filters:	99.97% efficient @ 0.3 microns HEPA Filtered Air Intake HEPA Filtered Exhaust Recirculation HEPA Filters
Temperature Range:	Above ambient to 280°C	Electrical:	All voltages available
Uniformity:	±5°C @ 250°C typical	Control Panel:	Attached or remote-standing console
Insulation:	4" thick fiberglass 6" thick fiberglass floor	Side Walls & Ceiling:	Easily removable for cleaning (no screws)
Heating:	Electric	Gasket Retention:	Brass nuts on stainless studs for rapid and easy gasket replacement



Hot Air Sterilizers/Depyrogenation Ovens

Changing of Hepa Filters

Gruenberg engineers have designed an easy way to access the HEPA Filters for testing or replacement. The HEPA filters are located behind a removable sidewall in the interior of the sterilizer. Simply lift up on the

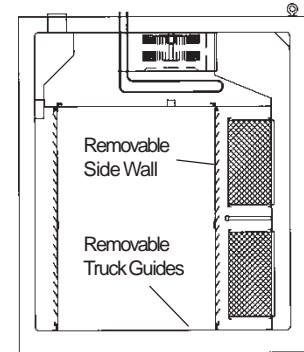


handles of the sidewall and remove the panel. No tools are required.

The recirculation HEPA filters are installed against a heavy-duty stainless steel wall. The wall is reinforced by structural steel so that filter sealing surfaces will remain square as the sterilizer

reaches maximum temperature. The frame also adds extra support for clamping of the HEPA filters.

The HEPA filter has a silicone gasket that provides a tight seal so that no particles shall bypass the HEPA filter. A stainless steel C-channel holds the filter in place. The clamping mechanisms are located against the filter frames and do not interfere with the airflow.



Standard Models	Max. Temp.	Interior Dimensions			Exterior Dimensions*			KW	Cubic feet of Interior Chamber Capacity
		Width Inches	Depth Inches	Height Inches	Width Inches	Depth Inches	Height Inches		
L55H8.3	280°C	20	30	24	48.75	38.5	54.5	7.5	8.3
L55H13.7	280°C	24	38	26	52.75	46.5	56.5	15	13.7
C55H15.17	280°C	24	26	42	52.75	34.5	72.5	18	15.17
C55H17.69	280°C	28	26	42	56.75	34.5	72.5	18	17.69
T55H20.2	280°C	26	28	48	54.5	36.5	78.5	18	20.2
T55H25.4	280°C	29	42	36	57.5	50.5	66.5	18	20.1
C55H30.2	280°C	27	42	46	55.75	50.5	76.5	24	30.2
T55H32	280°C	32	48	36	60.75	56.5	66.5	24	32
T55H43.9	280°C	43	34	52	71.75	42.5	82.5	30	43.9
T55H45.5	280°C	36	42	52	64.75	50.5	82.5	30	45.5
T55H52.52	280°C	30.5	42.5	70	59.25	51	100.5	30	52.52
T55H63.7	280°C	44	41	57	72.75	49.5	87.5	36	63.7
T55H76.3	280°C	47	61	46	75.75	70.5	76.5	45	76.3
T55H79.4	280°C	44	52	60	72.75	60.5	90.5	45	79.4
T55H89.3	280°C	45	52	66	73.75	60.5	96.5	45	89.3
T55H93.3	280°C	40	72	56	68.75	80.5	86.5	45	93.3
T55H109	280°C	43	80	55	77.75	88.5	85.5	45	109
T55H110	280°C	70	44	70	104.75	52.5	100.5	54	110
T55H134.1	280°C	48	67	72	82.75	75.5	102.5	54	134.1
T55H138.3	280°C	49	80	61	83.75	88.5	91.5	60	138.3
T55H209.5	280°C	48	130	58	82.75	138.5	88.5	72	209.5
T55H216	280°C	48	108	72	82.75	116.5	102.5	75	216
T55H245.4	280°C	57	120	62	91.75	128.5	92.5	90	245.4
T55H277.3	280°C	72	96	78	106.75	104.5	108.5	108	277.3
T55H335.9	280°C	62	120	78	96.75	128.5	108.5	108	335.9
T55H364.5	280°C	92	125	60	126.75	133.5	90.5	126	364.5
T55H582.6	280°C	56	214	84	90.75	222.5	114.5	144	582.6

*Note: The exterior dimensions listed above represent the cabinet dimensions of each unit. Typically, add 24" to the cabinet width for the control cabinet, 14-36" to the cabinet height for the top mounted equipment, and 10-12" to the cabinet depth for the doors and door hardware.



S Series Sterilization and Depyrogenation Oven

Controls

Gruenberg offers a standard control system with the S-Series line and the SCADA control system as an option.

Standard Control System

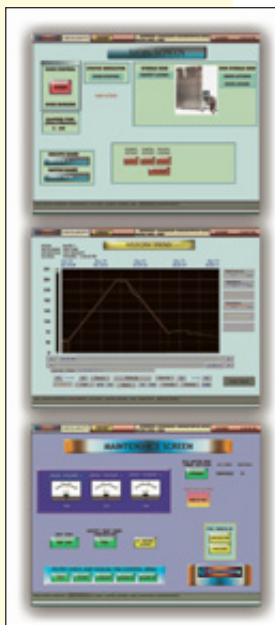
As a standard feature, Gruenberg provides a 21 CFR 11 ready control system equipped with PLC and OIT (Operator Interface Terminal) technology. The Allen Bradley Compact Logix PLC with on board Ethernet communications to connect to the Allen Bradley Panelview Plus 700 touch screen OIT. The Panelview Plus offers a TFT color screen, on board Ethernet connectivity, network security and audit trail capabilities (using A/B FactoryTalk) for 21 CFR applications, data logging, alarm logging and the ability to store up to 10 recipe profiles.



A multitude of screens offer the customer user friendly interfaces for security, maintenance screens including auto-tune, recipe generation and storage.

SCADA Control System (optional)

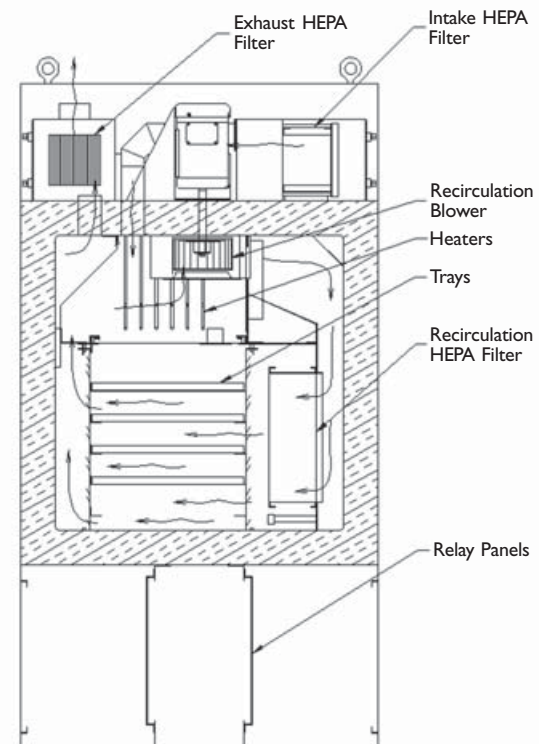
The SCADA (Supervisory Control and Data Acquisition) control system comes equipped with PLC and HMI (Human Machine Interface) technology. The Allen Bradley Compact Logix PLC with on board Ethernet communications to connect to a desktop or panel mounted touch-screen PC. The PC is loaded with Windows XP OS and Wonderware's Intouch 8.0 - HMI for standard or custom designs to meet the customers control system requirements.



The HMI comes complete with field installed and validated 21 CFR Part 11 ready control and data acquisition system.



Cycle Description/Air Path





S Series Sterilization and Depyrogenation Oven

Physical Specifications

Model	Interior Dimensions (in.)			Exterior Dimensions (in.)			Heating Input (Standard Ramp Rate)	Chamber Capacity (cubic feet)
	W	D	H	W	D	H		
SC55H8.3PTSS	20	30	24	45.75	47.75	85.38	9 kW	8.3
SC55H13.2PTSS	24	34	28	49.75	51.75	93.38	18 kW	13.2
ST55H31.4PTSS	32	34	50	70.75	51.75	97.38	24 kW	31.4
ST55H59.9PTSS	37	56	50	75.75	73.75	103.38	45 kW	59.9
ST55H95.8PTSS	48	69	50	86.75	86.75	103.38	54 kW	95.8

Gruenberg has available a variety of additional sterilizers to meet your specific requirements.

Note: Exterior dimensions are overall cabinet dimensions.

Performance Specifications

	Maximum Heating Rate	Maximum Cooling Rate (to 40°C)	Maximum Temperature	Estimated Cycle Time
Accelerated Ramp	10°C Min	4°C/Min Air	260°C	2.3 hours
	10°C Min	8°C/Min Water	260°C	1.9 hours
Standard Ramp	1.5°C/Min	1.5°C/Min	260°C	6.0 hours

Standard Features at a Glance

Frame:	Unitized construction for durability and handling (heavy-duty structural steel framework)
Exterior:	Stainless steel type 304 with a #4 finish typical
Interior:	Stainless steel type 304L with a 2-B finish and a continuously welded liner
Temperature Range:	Above ambient to 90°C steam or electric
Uniformity:	±2°C @ 80°C depending on circulation system
Insulation:	3" thick fiberglass
Heating:	Steam coil with regulator, or low watt density electric heaters
Circulation:	Recirculation external to chamber

Airflow:	Horizontal for superior uniformity
Motors:	Direct drive, (TEFC or XP depending on room classification)
Prefilter:	On air intake, 55% efficient HEPA filters: 99.97% efficient with a 0.3 microns HEPA Filtered Air Intake HEPA Filtered Exhaust
Electrical:	All voltages available
Control Panel:	Attached or remote-standing console
Side Walls & Ceiling:	Easily removable for cleaning (no screws)
Gasket Retention:	Brass nuts on stainless studs for rapid and easy gasket replacement



Granulation Dryers

Gruenberg manufactures granulation dryers from 15 to 800 cubic feet of chamber capacity. Steam units are rated up to 90°C, and electric units are available up to 260°C. Two types of circulation systems are standard: controlled recirculation and single-pass systems.

CONSTRUCTION

Granulation dryers, just like the sterilizers, are built around a welded structural steel frame for long-term reliability.

All interior surfaces are constructed of 100% continuously welded stainless steel for quick and easy washdowns. To simplify cleaning, both side walls are removable, and as an option, the floor may be sloped to a drain. Radius corners are optional.

The exteriors can be either painted cold-rolled steel or stainless steel depending upon your needs. Between the interior and exterior walls are over 3" of high-performance insulation.

AIRFLOW

Distinct perforated walls provide for a superior temperature uniformity of $\pm 2^{\circ}\text{C}$. Every dryer is fully tested for airflow and temperature uniformity by a multi-point strip recorder prior to shipping.

CONTROLLED RECIRCULATION

Controlled recirculation is the most common means of handling airflow in a granulation dryer. Heated air is passed over the product; before some of the air is exhausted, much of it is recirculated, reducing energy consumption. Temperature uniformity for controlled recirculation is more stable than in single-pass systems.

SINGLE-PASS SYSTEM

Single-pass systems heat the air, filter it, pass it across the load, then totally exhaust it. This system was developed for use with high alcohol or flammable liquid mixes.

HEPA FILTRATION

HEPA filters, 99.97% efficient, at 0.3 microns, are installed on the fresh air intake and the exhaust. The HEPA filters have a stainless steel frame and vary in thickness depending on airflow. A disposable pre-filter is installed upstream of the intake HEPA filter to remove larger particles and to extend the life of the HEPA filter. As the dryer cycles off, the exhaust HEPA filter prevents particles from entering back into the process chamber.

CONTROLS

Controls for granulation dryers are very similar to controls for the sterilizers pictured on page 3. Additional controls are shown on page 12. Control panels can be mounted on the side of the granulation dryer or placed in remote locations. Control panels are designed around their installation classification.

ADDITIONAL FEATURES

Typically, two magnehelic gauges are supplied to monitor the intake and exhaust HEPA filters. Photohelic gauges can replace the magnehelic gauges as an option. Photohelic gauges will sound an alarm if the HEPA filters are loaded beyond a preset pressure drop.

Door switches are standard on granulation dryers to prevent the oven from operating when the door is opened.

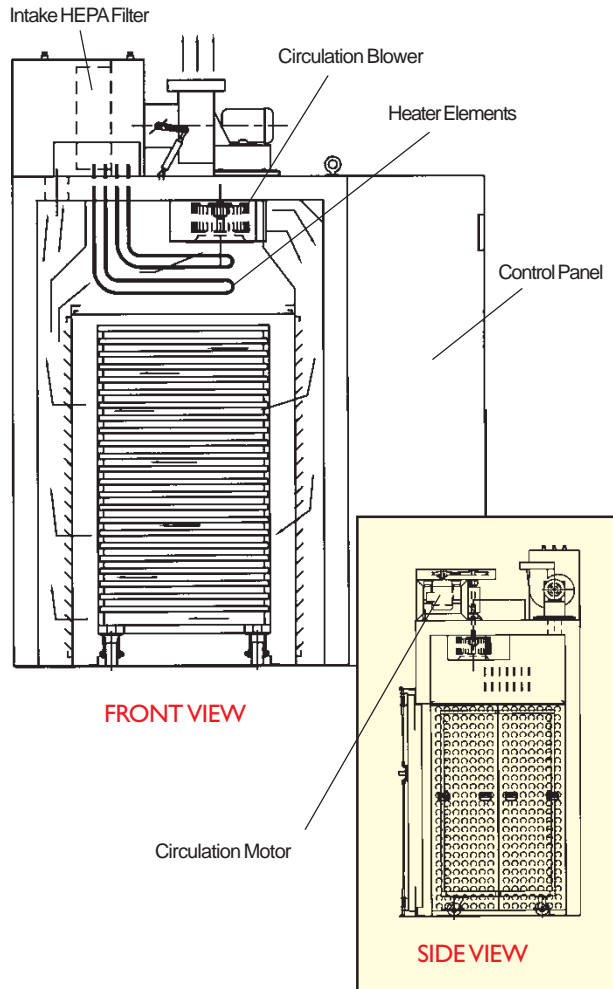
An electrical disconnect on the control panel protects maintenance personnel by de-energizing the power when the electrical access door is open.



128 ft³ custom double bay granulation dryer



Granulation Dryers



Typical Dryer Sizes	Interior Dimensions		
	Width Inches	Depth Inches	Height Inches
T18H28	28	48	36
T18H29	26	32	60
T18H35.4	36	36	48
T18H36	36	36	48
T18H46	20	20	20
T18H55.76	33	40	73
T18H69.38	45	36	74
T18H80.9	30	59	79
T18H95.8	54	42	73
T18HI05	54	42	80
T18HI11.7	58	52	64
T18HI29	75	48	62
T18HI56	42	107	60
T18HI82.25	81	54	72
T18H304	106	92.5	91.25
T18H374.5	92	107	72
T18H476	139	88	76

Exterior dimensions are a function of options; generally add 16-18" to width, 8-11" to depth, and 24-36" to height.

Standard Features at a Glance

Frame:	Unitized construction for durability and handling (heavy-duty structural steel framework)
Exterior:	Stainless steel type 304 with a #4 finish typical
Interior:	Stainless steel type 304L with a 2-B finish and a continuously welded liner
Temperature Range:	Above ambient to 90°C steam or electric
Uniformity:	±2°C @ 80°C depending on circulation system
Insulation:	3" thick fiberglass
Heating:	Steam coil with regulator, or low watt density electric heaters
Circulation:	Recirculation external to chamber

Airflow:	Horizontal for superior uniformity
Motors:	Direct drive, (TEFC or XP depending on room classification)
Prefilter:	On air intake, 55% efficient HEPA filters: 99.97% efficient with a 0.3 microns HEPA Filtered Air Intake HEPA Filtered Exhaust
Electrical:	All voltages available
Control Panel:	Attached or remote-standing console
Side Walls & Ceiling:	Easily removable for cleaning (no screws)
Gasket Retention:	Brass nuts on stainless studs for rapid and easy gasket replacement



Granulation Dryers

Explosion Resistant Granulation Dryers

Design requirements set by OSHA and NFPA 86A (Class A) must be added to any dryer processing alcohol, solvent mixes, or other volatile atmospheres within the dryer. Class A dryers require a specific exhaust rate to dilute vapors and an increased KW rating to compensate for the increased exhaust. Explosion venting relief panels or pressure-relief door latches are necessary, along with monitoring pressure switches that would shut off the heating system if the exhaust rate were to drop below acceptable limits.

Dryers operating in atmospheres that are Class I, Group D, require explosion resistant housings for all electrical; static-eliminating belt drives; explosion resistant motors, non-sparking hardware, purged control consoles, airflow switches and associated high limits and shut-offs.

GRUENBERG CAN MEET THE FOLLOWING REQUIREMENTS:

- Class I, Group D
- Class I, Group E
- Class I, Group F
- Class I, Group G

Consult the factory for any other Class or Group.



A custom-built device to supply conditioning air to a remote chamber. Class I, Division I Class.



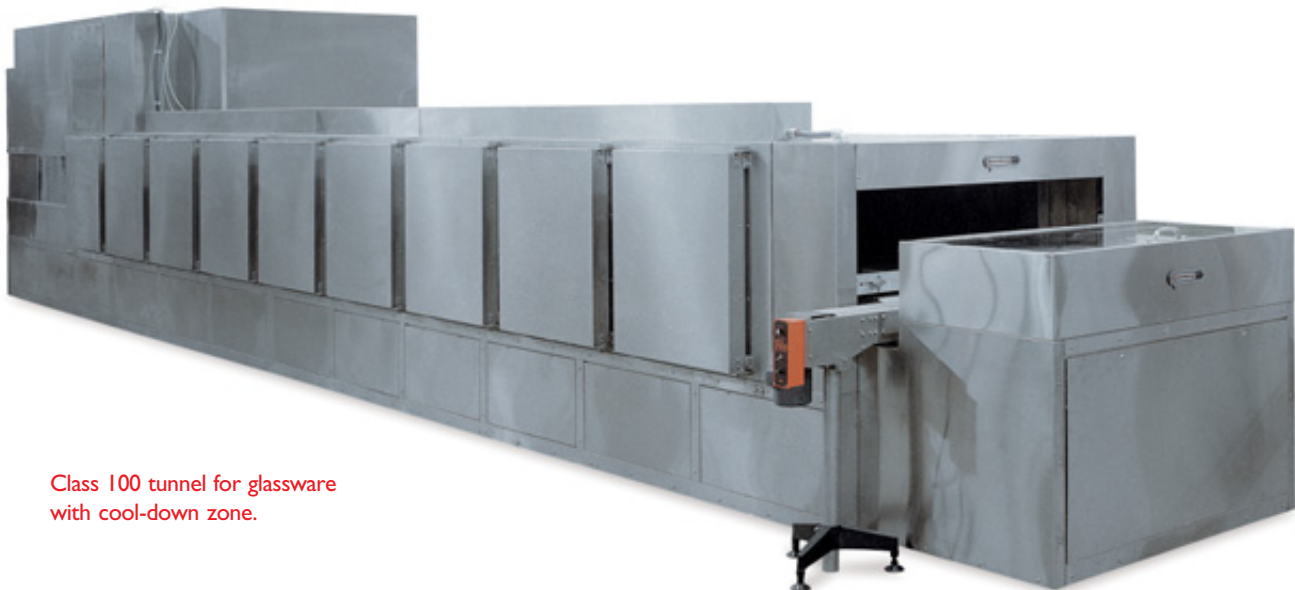
Custom explosion-resistant single pass dryer system, Class one with HEPA filter air intake.



Custom Granulation Dryers, Continuous Process, and Class 100 Sterilizers



Conveyor oven used to precisely and consistently dehydrate pharmaceutical solutions. Make up air and recirculated air is HEPA filtered to achieve Class 100 environment. Vertical down airflow with adjustable velocity for fine tuning of the process.



Class 100 tunnel for glassware with cool-down zone.

Typical Dimensions/Outputs

Belt Width Inches	Overall Dimensions			KW	GPM Chilled Water	Output		
	Width Inches	Depth Inches	Height Inches			2 ml	10 ml	20 ml
36	64	196	96	80	32	355	130	80
48	74	220	96	120	45	460	200	120



Trucks, Transfer Carts and Trays

Gruenberg offers many different sizes and types of trucks, trays, and transfer carts. Standard trucks and trays are shown here, but custom trucks and trays are available to fulfill any special requirements.

Trucks

Trucks provide a quick and efficient way to load and unload products. Single, double, triple, and quadruple bay trucks are available to match any product load. To simplify loading and unloading, a front or side loaded truck may be specified.

Standard truck construction is type 304 stainless steel with a 2B finish. Trucks are often 316L. The frame, casters, and shelf guides are all stainless steel for easy, frequent washdowns.

Transfer Carts

Trucks can be transported to and from sterilizers and dryers by transfer carts. The transfer carts keep the trucks off the floor, reducing the amount of dirt or contamination entering the process chamber. A spring loaded latch and truck guides keep the truck secure during transportation. Power-assisted transfer carts are also available.

Transfer carts are constructed of type 304 stainless steel with a 2B finish. Two swivel and two stationary, non-marking casters are supplied to permit ease of

movement and control.

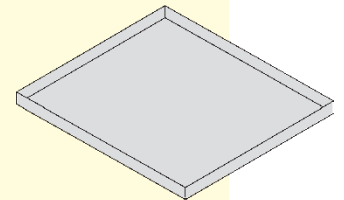
Loading the truck into the sterilizer or dryer is quick, easy, and safe. Simply line up the truck guides of the transfer cart with the truck guides of the process chamber, then lower the loading ramp located on the front of the transfer cart onto two steel pins on the process chamber floor. The transfer cart and process chamber are now locked together. Pull the spring latch on the back of the transfer cart to release the truck. Gently push the truck into the process chamber, raise the loading ramp, and close the door.



Trays

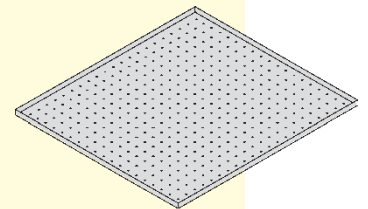
SOLID STAINLESS STEEL TRAYS

Solid trays are constructed of any type stainless steel. All seams are continuously heliarc welded and ground smooth.



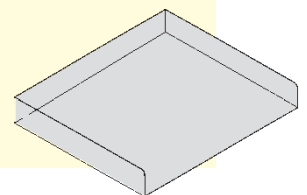
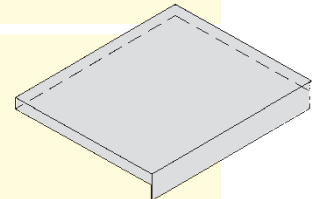
PERFORATED STAINLESS STEEL TRAYS

Perforated stainless steel trays typically have 3/8" diameter perforations on 1 1/2" centers. Larger and smaller sized perforations are available upon request.



COVERED STAINLESS STEEL TRAYS

Covered stainless steel trays are used with both sterilizers and granulation dryers. The covers protect the product from contamination and windage.



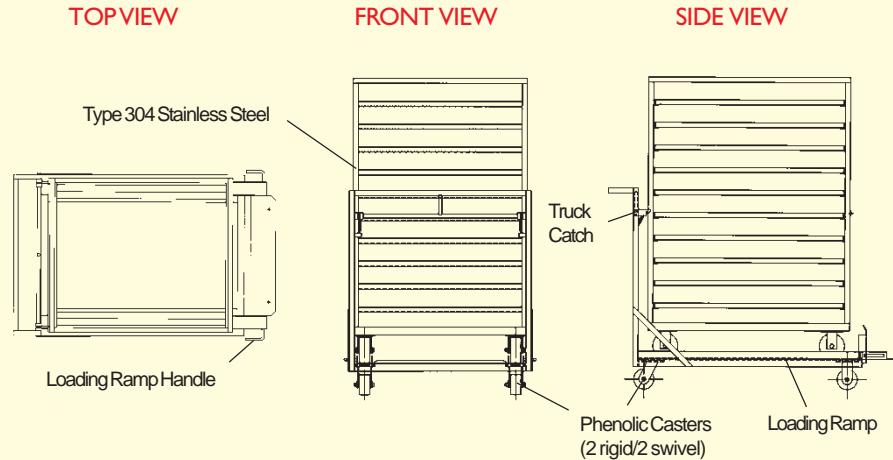


Trucks, Transfer Carts and Trays

Trucks - Standard and Custom

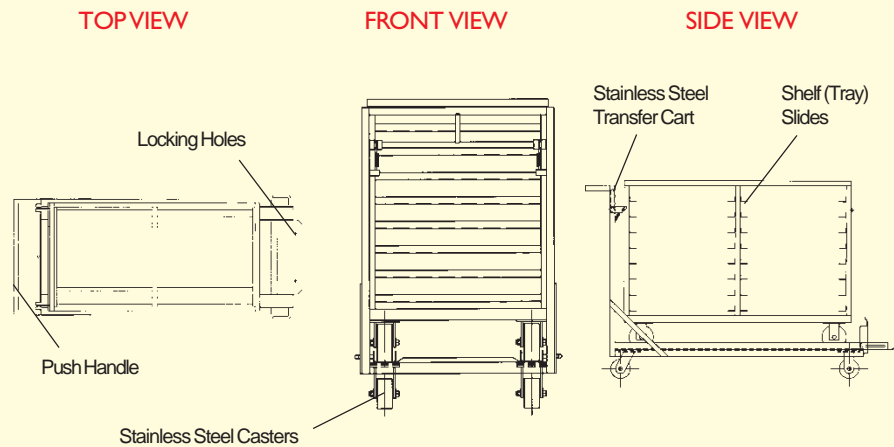
Single-Bay Truck (side loaded)

Single-bay trucks are used with small and medium sized sterilizers and dryers for maximum product loading. This truck can be used in medium size units if the product is light in weight.



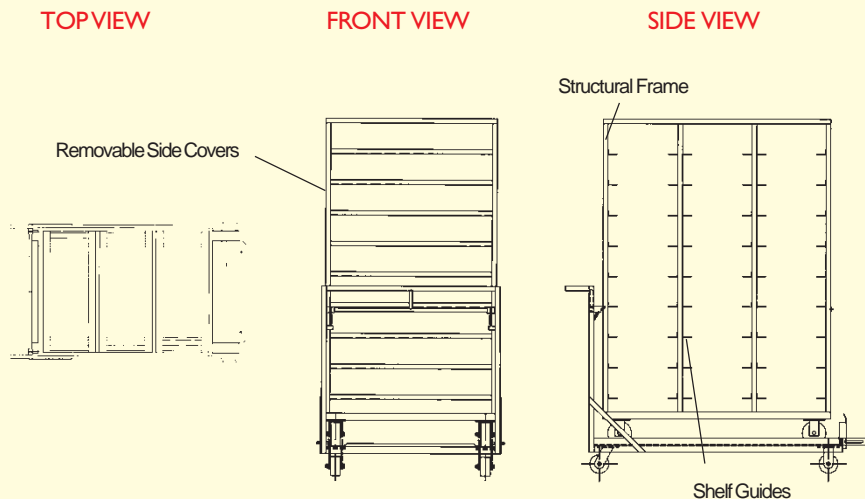
Double-Bay Truck (front loaded)

Double-bay trucks can be used with small, medium, and large sterilizers or dryers depending upon product load. Shown here is a front loaded truck with a transfer cart.



Triple-Bay Truck (side loaded)

Triple-bay trucks are used with medium to large sterilizers and dryers. The truck shown here has removable side panels to protect the product from contamination during transportation. Portable laminar flow units are also available to protect the product during transport.





Typical Controls

These recorders and controllers are used because of their reliability, accuracy, performance, and user friendly features. However, if a specific brand name of controller, recorder, or option is required, it can easily be incorporated.

PROGRAMMABLE TEMPERATURE CONTROLLER: MULTI-SEGMENT

This microprocessor programmable temperature controller has digital-set and digital-readout. The control can function as a normal process controller or it can execute any of eight set-point programs. Each program can have six ramps and six soak segments. With only four push button keys, the control is easy to

program and has control accuracy of $\pm 0.25\%$ of the scale range.

12 PROGRAM CONTROLLER (LINKING)

The 8-program microprocessor also has digital set and digital read-out. This controller can perform 12 programs with 16 segments per program. The programs can be linked together to extend certain capabilities.



Partlow 1462 digital programmable temperature controller



Optional Equipment

PHOTOHELIC GAUGES

Photohelic gauges measure the pressure differential upstream and downstream of the HEPA filters. The photohelic gauges have a low and high set-point. If the pressure differential should go above or below the setpoints, an audible alarm will sound and indication light will be activated.



SINGLE AND DOUBLE PEN CHART RECORDERS

Chart recorders provide visible documentation of the process temperature and length of the cycle. The solid-state Honeywell 4300 GP, electronic recorder is available with either a 24-hour or 7-day recording and has a 10" diameter circular chart. The recorder system comes with a thermocouple sensor accurate to within .5% of range scale.



Double-pen recorders use different colored pens and indicate process temperature and product temperature. The recorders are chosen for reliability, accuracy, and user-friendly features.

MULTIPOINT STRIP RECORDER

The multi strip recorder records up to 30 locations and prints the numbers in an easy-to-read format. All

the channels can be printed in 6 seconds with an accuracy of plus or minus .05% of scale. The recorder can be programmed to read from one minute increments to 24 hours. Additional features are the ability to be hooked into an alarm package and six color printing.



COMBINED RECORDER AND MICROPROCESSOR TEMPERATURE CONTROLLER

The combined recorder and controller utilizes either a single or double-pen, 10-inch circular chart. A 24-hour or 7-day recorder is available. The microprocessor controller has 8 programs with six ramp segments and six soak segments. The controller has an LED display and an accuracy of $\pm 0.25\%$ of span.



ABORT SWITCH

Switch on control panel that cancels the rest of the cycle and goes into off mode.

RAMPS

Removable ramps can be provided for loading and unloading trucks.

Options



Optional Equipment

DESIGN MODIFICATION

Specific design requirements can be fulfilled quickly and cost effectively.

PORTS

Any size port can be provided whether for DOP testing, thermocouple, or for any other reason. Stainless steel, sanitary fittings are used to seal off the ports when they are not in use.

SPECIAL VOLTAGE

Standard power is 230 volt, 60hz, single phase or three phase. All other voltages and specialty formats are available.

REMOTE MOUNTED CONTROL PANELS

Remote control panels or freestanding control consoles are available when control panels must be placed in different atmospheres or areas.

PRESSURE DIFFERENTIAL CONTROL SYSTEM

The pressure differential control system consists of two differential pressure transmitters, one Universal Digital Controller, one exhaust blower, one adjustable

frequency AC drive, and an electro-mechanical linear actuator for the intake pressure blower damper.

The differential pressure transmitters measure the difference between the interior work chamber and the sterile and non-sterile rooms. The Universal Digital Controller receives the outputs from the differential pressure transmitters, and generates a 4-20 milliamp output to the adjustable frequency AC drive, which controls the drive motor of the exhaust blower.

AREA SPECIFIC LAMINAR FLOW MODULES

Gruenberg specializes in the design and manufacture of area-specific protection for filling lines, operational stations, and accumulation or transfer areas that must remain under class 100 air.

SOLVENT VENTING PACKAGE

Gruenberg includes properly sized exhausting system, high limit thermostat with main power back-up relay, airflow switches on the exhaust and circulation, purge timers, and additional kilowatt compensation.

ISOLATOR COMPATIBLE

Air tight chamber designs can be supplied for ovens interfaced to isolators and barrier systems.

Panels

BIOSEAL OR SEALING FLANGE FILLER PANELS

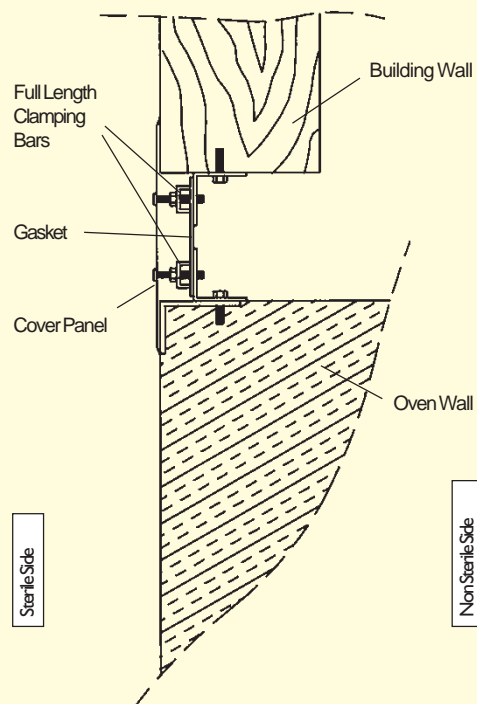
These panels are used to create the absolute seal between a sterile and non-sterile area. The seal prevents biological agents or contaminated air from entering the sterile side. Typically, the seal is used with a pass through design.

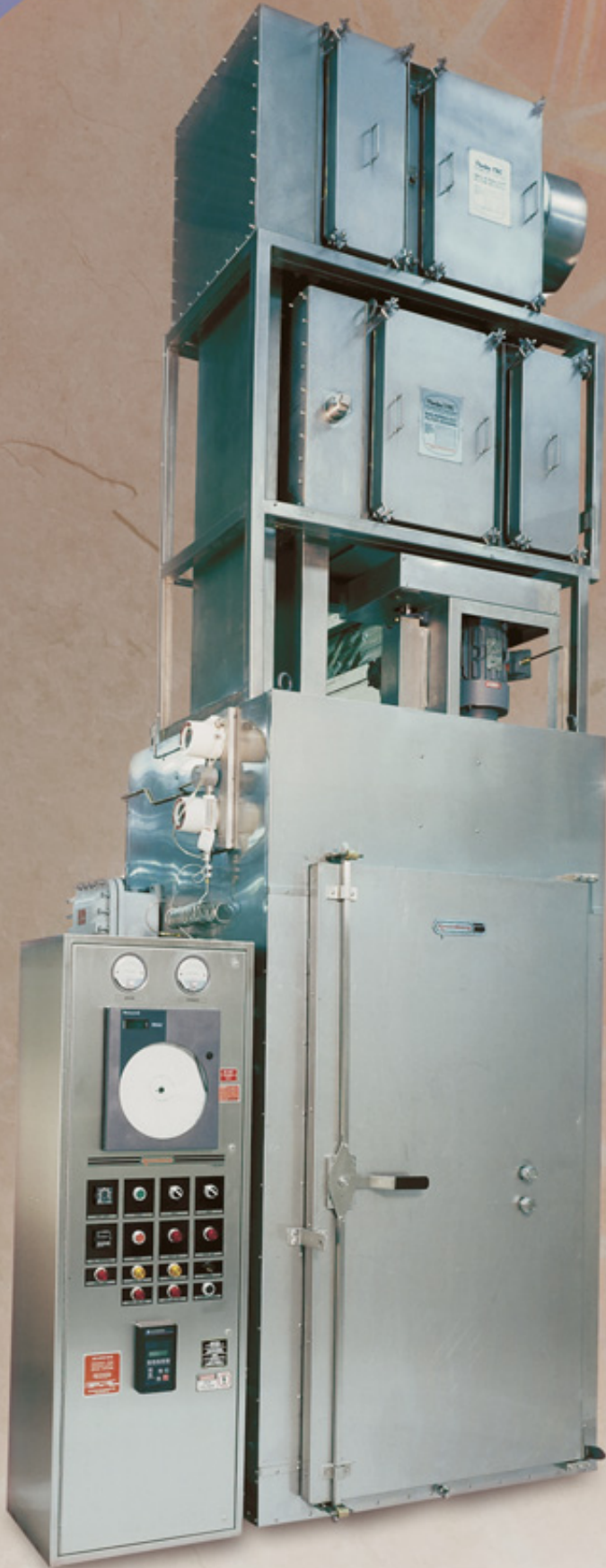
The filler panel is constructed of type 304 stainless with a #4 polish. The panels can be constructed of other materials to match the exterior of the dryer or sterilizer.

TRIM PANELS

When sterilizers or dryers are installed within a wall and an absolute seal is not required, a trim panel is installed. The trim panel connects the oven with the wall and is installed on the non-sterile side of a pass through sterilizer.

The panel is constructed of type 304 stainless steel with a #4 polish as standard. Other material can be specified.





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