



# Gruenberg

# DRY HEAT STERILIZERS



Save  
One Million  
Gallons of  
Water  
Annually



- ✓ SUSTAINABLE ENERGY, LOW OPERATING COSTS
- ✓ NO STEAM, NO WATER, NO CONDENSATE
- ✓ HEALTHIER LAB WORK ENVIRONMENT
- ✓ VALIDATED STERILIZATION CYCLES



**TPS**<sup>TM</sup>  
Thermal Product Solutions

# PROVEN TECHNOLOGY

## Design Expertise

Since 1932, Gruenberg Oven has designed and manufactured high quality, custom and standard pharmaceutical sterilizers, dryers and continuous process ovens. Pursuing a philosophy of uncompromising performance, Gruenberg has emerged as a leader in the manufacturing of dry heat sterilizers for laboratory, laboratory animal and Class 100 cGMP sterilizers for pharmaceutical production.

Our experience in designing custom systems translates into lower ownership and infrastructure costs, sustainable processes, precision process control, long-term reliability, and higher overall satisfaction. Oven design and components are continuously tested and researched to assure superior performance, ensuring the latest in technology and reliability.

Gruenberg Oven enjoys one of the highest customer retention rates of any life sciences, dry heat sterilizer 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 customers.



**“A Perfect Solution.”**

*-Lab Manager*

## Limitless Design Possibilities

Intuitive User Interface

Internet of Things (IOT)

Precision Process Control

Optimized Production Processes

Reliability & Sustainability

Development of Test Platforms

Proof of Concept & Proof of Process

Research & Validation Testing

# DRY HEAT STERILIZATION

## Sustainable Solutions

Dry heat sterilization eliminates, removes, kills or deactivates all forms of life and other biological agents (such as fungi, bacteria, viruses, spore forms and prions) by raising the temperature of an item to above 320°F.

Our lab sterilizers are ideal for laboratory and pharmaceutical applications. Dry heat ovens have several advantages over steam autoclaves, including higher temperatures and the ability to sterilize materials that might be damaged by steam or are impenetrable to moist heat.

Dry heat sterilization systems use a unique focused forced air convection airflow designed to minimize cycle time while maximizing the product throughput capability.

Compared with steam sterilization, dry heat sterilization is a greener technology that eliminates water usage, provides more flexibility for installation locations, requires less maintenance, and costs less to own and operate.

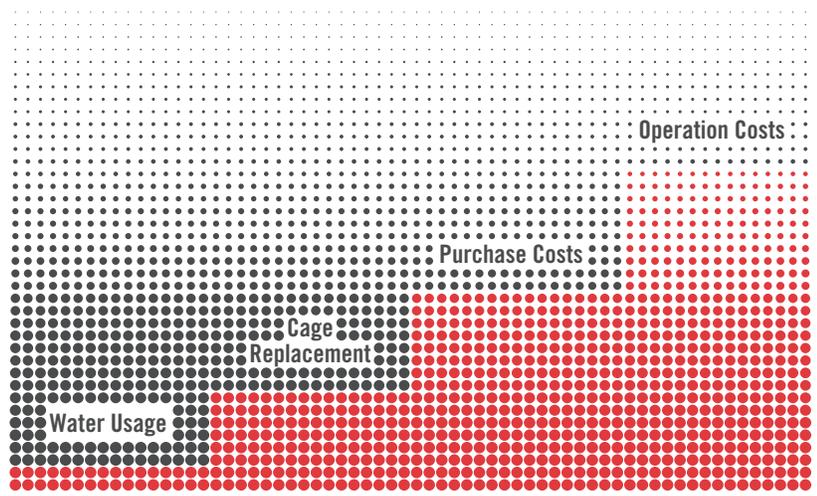
The initial cost of available dry heat sterilizers is about 60% of equivalent sized steam autoclaves. A dry heat sterilizer is two to three times lighter than an equivalent steam system, and can be rigged in place as modules for considerably less rigging challenges and costs.

Depending on the load configuration and cool down requirements, the typical cycle lasts less than 3 hours.

## Dry Heat Applications:

- Laboratory hardgoods such as metals, glassware and some plastics
- Laboratory garments, masks and PPE
- Depyrogenation of glassware used in the laboratory - non-cGMP sterilizers
- Laboratory animal cages, IVC racks, enrichment, etc.
- Depyrogenation of glassware for pharmaceutical use such as vials - cGMP sterilizers
- Sterilization of parts used in the manufacturing of biological and pharmaceutical products, such as metals - cGMP sterilizers

## Autoclave



**Dry Heat**

# OUR SERVICES

## Engineering Design Services

- Direct access to our engineering staff
- Proof of Concept & Proof of Process
- Development of test platforms and prototype units
- Pharmaceutical process research and testing
- Process optimization integrated into Design
- Custom solutions for custom applications



## Quality Assurance

Gruenberg employs a progressive quality system to verify each state of construction. Dry heat sterilizers are rigorously tested for performance and safety. Our testing and calibration laboratory is accredited in accordance with ISO/IEC 17025:2005 and meets the requirements of ANSI/NCSLI Z540-1-1994.

- Validated Sterilization Cycles
- Functional & Safety Testing
- Temperature Uniformity
- Cycle Development Testing
- Biological Indicator Testing
- Assembled or Nested Cages
- Calibration
- HEPA Filter Testing
- GAMP validation packages include FAT, SAT, HDS, SDS, and IQ/OQ/PQ.
- Additional Testing Available

## Aftermarket Parts & Service

Thermal Product Solutions, LLC (TPS) provides a full range of aftermarket services for their equipment. All aftermarket services are performed by TPS factory trained technicians. Available services include:

- Start-up and Training
- Equipment Installation Options
- Preventive Maintenance
- Temperature Uniformity
- GAMP Documentation
- Instrument Calibrations
- Water Quality Analysis
- Rental Units
- Retrofits & Refurbishment



Installation



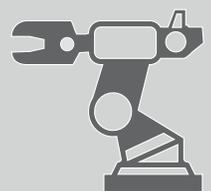
Calibration



Validation



Preventive Maintenance



Retrofits

# MODEL TYPES



## CABINET STYLE STERI-DRY™

## FEATURES

- Temperature Range: 356°F Maximum
- Chamber Size: 16 cubic feet
- Direct drive circulation system
- With smaller load requirements in mind, capacity up to 72 standard and nested mouse cages
- Single door or pass through
- Shelf loaded or roll-in-rack



## SINGLE TRUCK STERI-DRY™

## FEATURES

- Easily assembled modular panels utilizing tongue-and-groove construction and secured with screws
- Accommodates one (1) loading truck, either 22" W x 56" D X 40" H or 24" W x 60" D X 60" H
- High-volume, 8,000 CFM horizontal airflow system, with 5 HP belt-driven circulation blowers and forced exhaust system
- Intake and exhaust HEPA filters, with magnehelic gauges to monitor static pressure
- Thermally insulated NEMA-12 control box
- Quiet operation (won't disturb staff or noise-sensitive animals)
- Validated sterilization cycles for assured results
- Easy-to-use controls and access to cages



# MODEL TYPES



## MULTI-TRUCK STERI-DRY™

## FEATURES

- Temperature Range: 400°F Maximum
- Chamber Size: 96 to 362 cubic feet
- PrecisionFlo Full Focused Airflow
- HEPA Filters
- Data acquisition capabilities
- Panelized design
- Sequential door lock system
- Interior chamber door lock override system
- Multifunction programmable controller
- Color touchscreen
- Real-time data with recipe setup and storage
- SCADA compliant



## PHARMACEUTICAL STERILIZERS AND DEPYROGENATION OVENS

## FEATURES

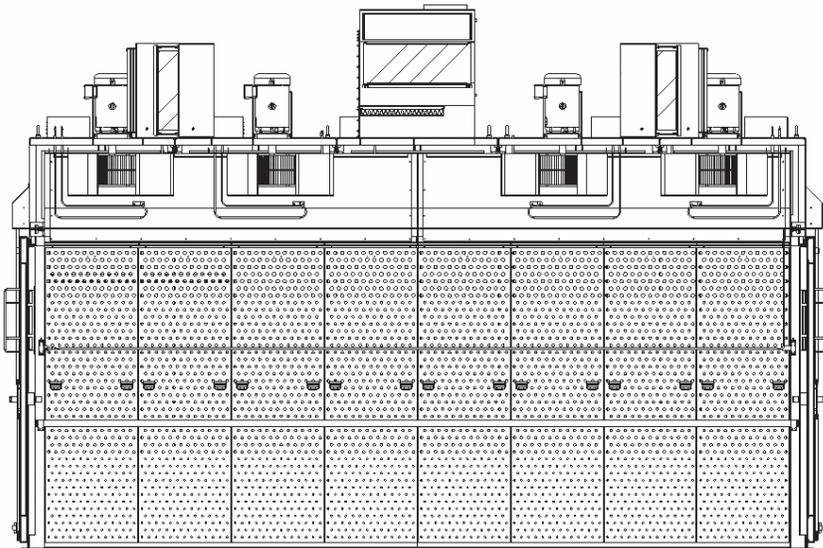
- 8.3 cubic feet to 600 cubic feet
- Heavy-duty, fully welded, structural steel frame
- Interiors and exteriors constructed of 16 and 18-gauge 304L stainless steel, or if required 316L
- Removable side walls and loading tracks
- HEPA filters on air intake, exhaust, and recirculation airflow
- Web-based service connectivity
- Bio-seal flange
- Interlocked pressure sensitive doors (pass-through configuration)

# PRECISION AIRFLOW

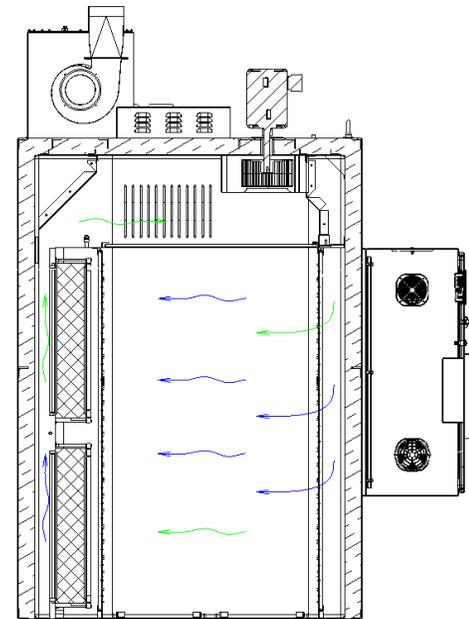
High volume, precision airflow systems are available in a variety of configurations. Powered circulation blowers / fans located in the conditioning plenum direct air to a circulation duct on one side of the sterilizer.

Air enters the workspace through a finely tuned perforated duct wall, flows across the product, and exits the workspace through the opposite side for recirculation. Allen-Bradley Variable Frequency Drives (VFDs) allow for uniformity optimization.

Blower shafts and wheels are dynamically balanced together to insure quiet, long term and reliable operation. The forced exhaust blower system is controlled by the PLC at a low speed to assist with temperature uniformity during the sterilization period, and cooling at the end of the cycle.

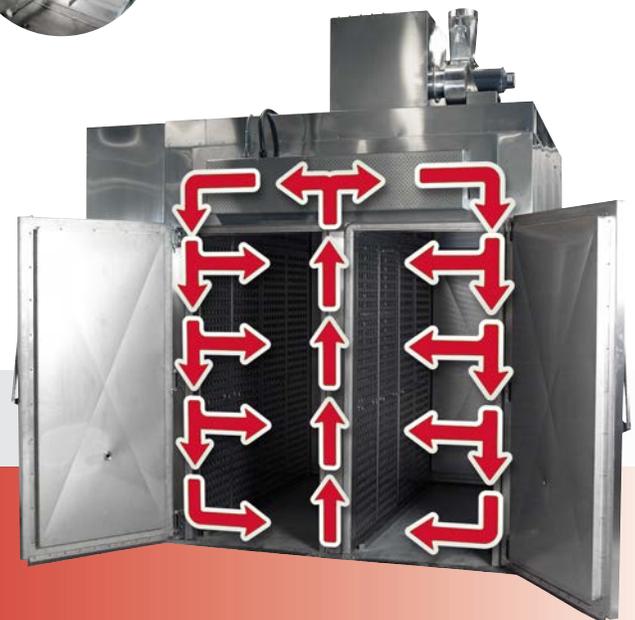


Pressure differential switches monitor airflow in the air stream of the circulation and forced exhaust systems. Upon failure of either system, the switch will signal the PLC to de-energize the heater circuit.



HEPA Filtration rated at 99.97% efficiency for particles 0.3 microns or larger ensures that air entering the sterilizer is sterile to protect the load during, and after, the cycle.

D.O.P. Challenge ports are provided for the verification of filter integrity.



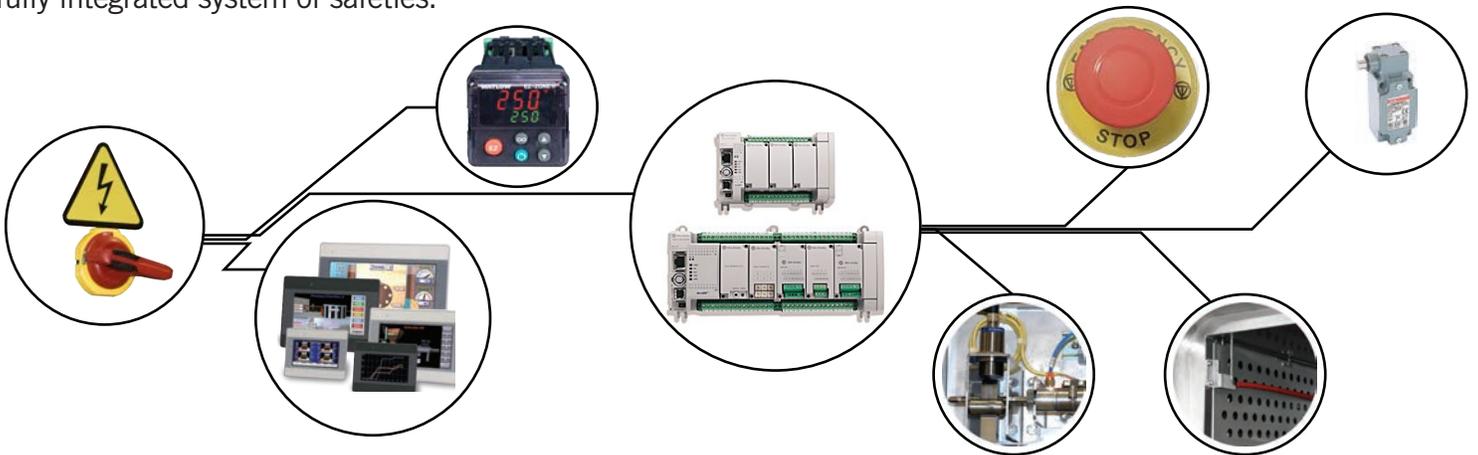
**100% focused forced-air convection technology.**

**\*\*\*Patent Pending**

# TOTAL PROCESS CONTROL

## Limitless Configurations

Gruenberg offers a broad selection of controls and control systems. Control panels can be mounted directly on the sterilizer or in a remote console. The main operating controls for the sterilizer are located in a single free-standing control console and house the load side Operator Interface touchscreen terminal and PLC. Circuit wiring is complete, including a step-down transformer to provide the control circuits with 110-volt power. Wiring in the control console terminates in a suitable block for connection to the customer's power supply. Gruenberg uses a full 10" color touchscreen display for ease of use coupled with an Allen-Bradley PLC. Protect personnel and product with a fully integrated system of safeties.



## INTEGRATED SYSTEM OF SAFETIES

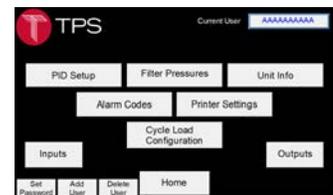
- The **Main Power Disconnect Switch** assures that the panel power is de-energized before the access door can be opened. Available in Lock Out / Tag Out.
- **Emergency Stops** on both the load and unload end control consoles immediately abort the process cycle and unlock all doors.
- An **Interior Safety Pull Cable** shuts down the sterilizer and unlocks the door when pulled.
- **Pneumatic Door or Electro-mechanical Locks** remain locked during the process cycle.
- **Door Switches** ensure doors are closed prior to and during the process cycle.
- **Audible alarms** and **Banner Displays** provide immediate notification to operators. The control system may be connected to customer's network via integral Ethernet connection.
- **Pressure Differential Switches** monitor airflow in the air stream of the circulation and forced exhaust systems. Upon failure of either system, the switch will signal the PLC to de-energize the heater circuit.
- **Differential Pressure Transmitters** measure the differential pressure across HEPA filters and send a signal to the PLC. The PLC monitors the pressures for filter integrity and alarms if the filter is fully charged or has been breached.
- Additional configuration options are available.

# CONTROLLER FEATURES

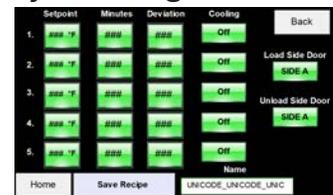
## Process Control

- The control system monitors sterilizer performance using an **Allen Bradley Programmable Logic Controller (PLC)** with on board Ethernet communications.
- **Audible alarms and banners** display provide immediate notification to operators. The control system may be connected to customer's network via integral Ethernet connection.
- The **OIT high resolution graphic display** features a 10" diagonal screen size. The OIT provides recipe management, data trending, process control, alarm and event monitoring, etc.
- A separate, independent **High Limit Thermostat** de-energizes the heating system should the process temperature reach the customer's preset limit.
- A **Thermal Dot Matrix Printer** records and prints critical process cycle data from the PLC.
- A **Communications Interface Module** includes an Ethernet Port, USB port, and a 120 VAC outlet for the connection of an external PC to perform software maintenance. Cycle data is easily downloaded via the USB port.
- The **Main Power Disconnect Switch** assures that the panel power is de-energized before the access door can be opened. Available in Lock Out / Tag Out.
- **Emergency Stops** on both the load and unload end control consoles immediately abort the process cycle and unlock all doors.
- **Built to NEC standards.** UL508A Labeled. CE, cUL, CSA, and other electrical certifications available upon request. Gruenberg Steri-Dry dry heat sterilizers are rated as NFPA 86 Class "B" ovens.

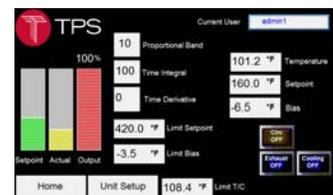
## Intuitive User Interface



## Cycle Configuration



## Precision Control



# STANDARD FEATURES

## Construction

- Gruenberg sterilizers are flexible in design and rigid in construction with a heavy duty, structural steel frame for long term durability.
- The fully welded, ground and polished 304SS interior (316L SS optional) seals the entire chamber. 4-inch thick high performance insulation minimizes heat loss.
- The exterior of the oven is constructed of 16 and 18-gauge type 304 SS with a #4 polish to withstand frequent washdowns.
- Chamber Size: 1.25 to 1000 cubic feet
- Modular/Split construction is sized for ease of rigging and assembly without modification of the existing facility. This design flexibility ensures that the project costs are well contained.

## Precision Airflow

- High volume airflow systems are designed for superior temperature uniformity. Multi-point uniformity tests and validated sterilization cycles assure oven performance conforms to specification.
- Gruenberg uses distinct perforated side wall ducts that allows fine tuning of the airflow.

## Temperature Uniformity

- Electric, Incoloy sheathed heaters reach sterilization temperature quickly and efficiently. Temperature uniformity of the air within the empty chamber is guaranteed to be within a tolerance of  $\pm 5^{\circ}\text{F}$  or better.

## Filtration

- To keep the process chamber air clean, HEPA filters are installed on the air intake and exhaust. The HEPA filters are a minimum 99.97% efficient at 0.3 microns.
- HEPA filtration prevents contaminants from entering the sterilizer during operation as well as discharge into the work area.
- Recirculation HEPA filters can be added to filter the air before each pass through the chamber.

## Total Process Control

- Thermally insulated NEMA-12 control box
- UL508A Labeled. CE, cUL, CSA, and other electrical certifications available upon request. Gruenberg Steri-Dry dry heat sterilizers are rated as a NFPA 86 Class “B” ovens.
- The integrated system of safeties can be configured to ensure operator and product safety.
- Intuitive, simple, easy-to-use color touchscreen controls provide precision process control with data acquisition capabilities.
- Sequential door lock system for pass through models
- Interior chamber door lock override system for larger walk in or truck in systems

## Quiet operation

- Won't disturb staff or noise-sensitive animals

# MECHANICAL OPTIONS

## Conditioning Equipment

### HEPA Filtration

- Intake filter prevents contaminants from entering the oven during operation
- Exhaust filter prevents contaminants given off to enter into the exhaust airstream

### Cooling Coil in Intake Stream

- Cools intake air for enhanced cooling during the cool down cycle
- Chilled water or glycol supply (38° to 50°F)
- Aluminum finned copper tube coil

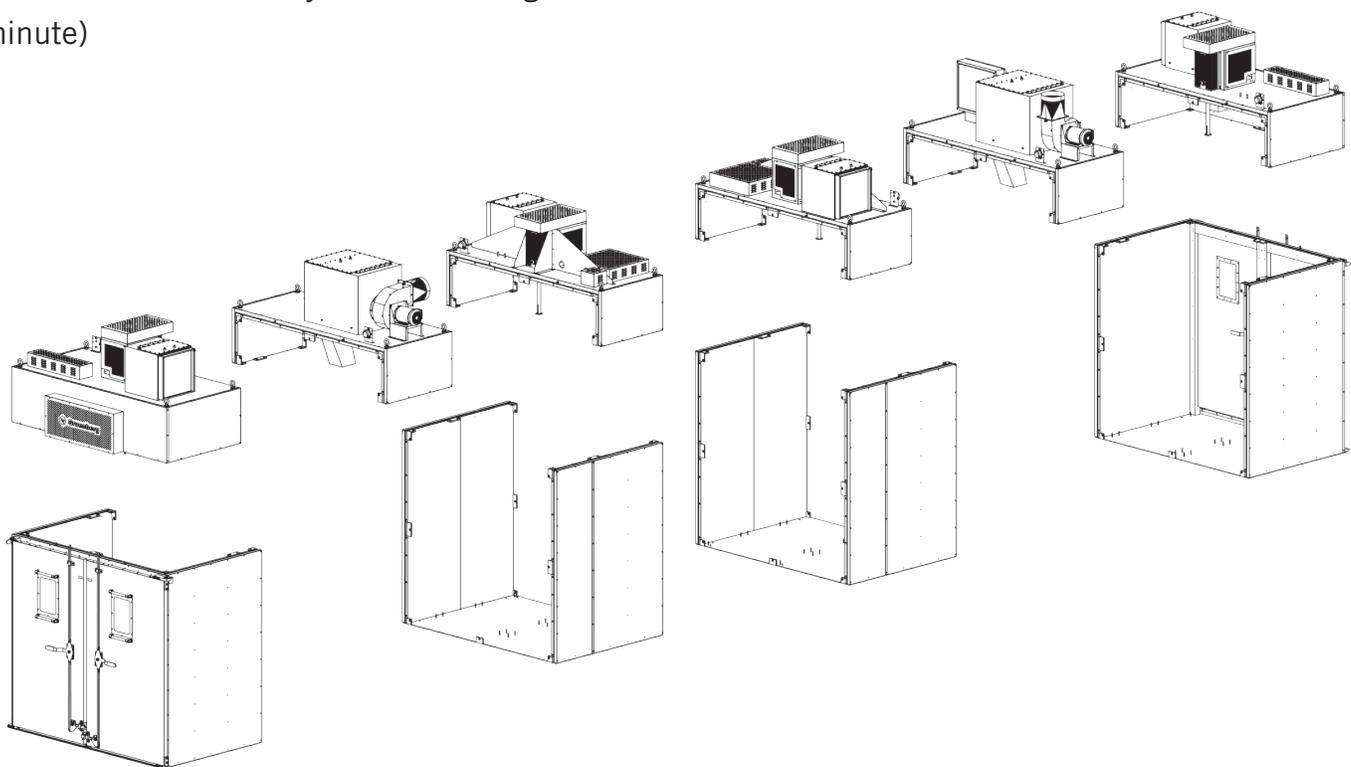
### Pressure Differential Control System

- Maintains a chamber static pressure that is greater than the non-sterile room pressure, but less than the sterile room pressure

### Accelerated Sterilizer Cycle Time (8 Degrees C / minute)

## Additional Options

- Modular Construction ease of rigging and assembly without modification
- 304 - #4 polished exterior
- Reverse door swing
- Steam heat
- Trim panels
- Seismic bolt-downs
- Solvent venting package
- Bio/Vermin Seal
- Stainless Steel Trucks and Trays



# ELECTRICAL OPTIONS

## **Allen-Bradley MicroLogix PLC with Intuitive Touchscreen HMI**

- 10 Digital inputs
- 6 Digital outputs
- 2 Analog inputs
- Ability to add digital, analog, RTD, and thermocouple modules to customize the controller for your application.
- Supports expansion I/O -- up to four 1762 I/O modules
- High speed I/O: 20 kHz HSC, 20 kHz
- PTO/PWM output
- 4KB user-program memory
- 4KB-word, user-data memory
- Up to 128KB for data logging and 64KB for recipes
- Built-in 10/100 Mbps EtherNet / IP Port
- 600Mz 32-bit RISC fanless processor
- 128MB Flash, 128MB DRAM memory
- TFT LCD touchscreen color display
- Export to Excel compatible CSV files
- Alarm & event e-mail notification
- UL, IP65, RoHS, NEMA 4 (indoor only), CE

## **SCADA Control System**

- MI and PLC technology
- Process control with desktop PC
- Optional panel mounted touch screen PC is available as the HMI
- Analog and digital input/ output modules used by PLC
- Windows XP OS and Wonderware's Intouch 8.0

## **Allen-Bradley Compact Logix with PanelView 700 Plus HMI**

- Modular-type PLC
- Analog and digital input/output modules
- Up to 30 I/O modules may be utilized
- VersaView CE 700H
- Powerful OIT
- TFT color touch screen
- Up to 10 recipe profiles
- System auto tune
- Maintenance and security-function access
- Generates process and alarm-logging data
- RS232 data communications

## **21 CFR Part 11 Ready Systems**

- Stand alone configuration comply with 21 CFR 11 in conjunction with the Temperature Recorder.
  - Ethernet connectivity, network security (only)
  - Audit trail capabilities (using A/B FactoryTalk)
  - Data logging
  - Alarm logging
  - Recipe storage and management

## **Voltage variations available**

## **Temperature Recorder, Strip Chart**

## **Communications Interface Module**

## **Additional Options Available**

# ACCESSORIES

A variety of configuration options are available for custom applications.

## Loading Trucks

Stainless steel shelves, trucks and trays are available in a variety of sizes and configurations for all applications. Trucks and trolleys can also be designed with conditioning equipment for enhanced temperature control.



## Bio/Vermin Seal

Bio/Vermin seals provide an impassable barrier to rodents on the top and sides of the unit. Trim panels matched to the exterior of the sterilizer are fitted to cover the area between the wall opening and the unit so that a flush appearance is achieved.

For enhanced biosecurity, Gruenberg offers full bioseals in either a gasketed or fully welded configuration.



Explore more options for a fully customized design:





**TPS**<sup>™</sup>  
Thermal Product Solutions

**Baker Furnace, Blue M, Gruenberg, Lindberg/MPH, Lunaire, Tenney, Wisconsin Oven**

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