



Quality

## Vertical and Benchtop Autoclaves for Life Sciences

# Designed for Your Laboratory Applications



## Advanced Laboratory Autoclaves

Tuttnauer laboratory autoclaves have been designed to provide high quality repeatable performance and accountability for a wide range of applications used in modern laboratories, which include:

- Liquid sterilization (using flexible PT100 probe) with various cooling options
- Pipette and Glass sterilization
- Instrument sterilization (wrapped or unwrapped)
- Biohazard and Waste sterilization
- Agar preparation



The features of the laboratory autoclave line are specifically designed for laboratory applications used in research institutes, universities, medical, pharmaceutical, biotechnology, food and chemical industries.

Successful sterilization requires the confidence that your sterilization equipment has the necessary features for the desired sterilization application. Each model has a number of optional added-value features which can be configured for fast cooling, efficient drying, biohazard and waste sterilization,  $F_0$  control, and more.

The benchtop autoclaves are designed to save space on your laboratory workbench while the vertical autoclaves are designed for your convenience and ease of use when vertically loading the autoclave.

For life science applications the Tuttnauer line of vertical and benchtop autoclaves successfully meet the challenges in today's laboratories with a flexible range of features and a sophisticated control system.

# Vertical Autoclaves

Tuttnauer vertical laboratory autoclaves are top loading autoclaves available in chamber sizes from 31 to 160 liters. ELV models have an advanced microprocessor control panel and a chamber made of 316L or 316Ti stainless steel. Built-in printer is optional.



3840 ELV  
3850 ELV  
3870 ELV

2840 ELV

5050 ELV  
5075 ELV

## Vertical D-Line Models - Technical Data

D-Line Model	Chamber Dimensions ØxD (mm)	Chamber Volume (Liter)	External Dimensions WxHxD (mm)
2840 ELV	280 x 460	31	540 x 980 x 440
3840 ELV	380 x 400	52	730 x 1000 x 540
3850 ELV	380 x 500	65	730 x 1000 x 540
3870 ELV	380 x 690	85	730 x 1000 x 540
5050 ELV	500 x 500	110	870 x 860 x 770
5075 ELV	500 x 750	160	870 x 1090 x 770

## Erlenmeyer Flasks (ml) Loading Capacity

Model	250	500	1000	2000	3000	5000
2840	2 x 5	2 x 3	1	1	1	1
3840	2 x 12	1 x 8	1 x 5	1 x 2	1	1
3850	2 x 12	2 x 8	1 x 5	1 x 2	1	1
3870	3 x 12	3 x 8	2 x 5	2 x 2	2 x 1	1
5050	2 x 21	2 x 14	2 x 8	1 x 5	1 x 4	1 x 2
5075	3 x 21	3 x 14	3 x 8	2 x 5	2 x 4	1 x 2

## Schott-Duran Flasks (ml) Loading Capacity

Model	250	500	1000	2000	3000	5000
2840	2 x 8	2 x 5	1 x 3	1	-	1
3840	2 x 19	2 x 12	1 x 8	1 x 4	-	1
3850	2 x 19	2 x 12	1 x 8	1 x 4	-	1
3870	3 x 19	3 x 12	2 x 8	2 x 4	-	1
5050	2 x 32	2 x 21	2 x 15	1 x 8	-	1 x 4
5075	3 x 32	3 x 21	3 x 15	2 x 8	-	2 x 4

\* External dimensions may change when an optional internal steam generator is added

## Benchtop Autoclaves

Tuttnauer benchtop laboratory autoclaves are front loading autoclaves available in chamber sizes from 28 to 160 liters. EL models have an advanced microprocessor control panel and a chamber made of 316L or 316Ti stainless steel. Built-in printer is optional.



### Benchtop D-Line Models - Technical Data

D-Line Model	Chamber Dimensions ØxD (mm)	Chamber Volume (Liter)	External Dimensions WxHxD (mm)
2840 EL	280 x 400	28	530 x 440 x 630
3840 EL	380 x 400	52	720 x 540 x 765
3850 EL	380 x 500	65	720 x 540 x 765
3870 EL	380 x 690	85	720 x 540 x 940
5050 EL	500 x 500	110	860 x 740 x 890
5075 EL	500 x 750	160	860 x 740 x 1120

\* External dimensions may change when an optional internal steam generator is added

### Erlenmeyer Flasks (ml) Loading Capacity

Model	250	500	1000	2000	3000	5000
2840	1 x 9	1 x 4	1	0	0	0
3840	1 x 12	1 x 9	1 x 5	1 x 2	0	0
3850	1 x 17	1 x 11	1 x 6	1 x 3	0	0
3870	1 x 23	1 x 17	1 x 10	1 x 5	0	0
5050	1 x 25 1 x 16	1 x 15 1 x 12	1 x 7	1 x 4	1 x 2	1 x 2
5075	1 x 50 1 x 18	1 x 18 1 x 18	1 x 15	1 x 7	1 x 4	1 x 3

### Schott-Duran Flasks (ml) Loading Capacity

Model	250	500	1000	2000	3000	5000
2840	1 x 12	1 x 9	1 x 5	0	-	0
3840	1 x 20	1 x 13	1 x 8	1 x 4	-	0
3850	1 x 27	1 x 16	1 x 11	1 x 6	-	0
3870	1 x 36	1 x 23	1 x 18	1 x 9	-	0
5050	1 x 35 1 x 27	1 x 20 1 x 16	1 x 12	1 x 6	-	1 x 3
5075	1 x 55 1 x 39	1 x 32 1 x 27	1 x 20	1 x 10	-	1 x 5

\* Optional shelves are needed to accommodate some of the loading capacities mentioned above.



## Advanced Control System for Your Laboratory

Take Advantage of Tuttnauer's state-of-the-art Control System with Multi-Color Display

### Features

- $F_0$  software control
- PID (Proportional Integral Differential) pressure control
- Stores the last 200 cycles in built-in memory
- Two PT100 sensors according to IEC61010-1, IEC 61010-2-040
- Up to 6 temperature sensors and 4 pressure sensors can be connected
- 30 Identification Codes and Passwords for access level control
- The controller and software comply with the 21 CFR part 11 standard
- In/Out test (enables technicians to check each system component separately)
- Sterilization Temperature range from 105°C to 137°C
- Optional Disinfection/Isothermal Temperature range from 60°C to 105°C
- Optional Independent Recording for cross-checking cycle measurements
- Filter replacement notifications based on the number of cycles

### Sophisticated Multi-Color Display

Tuttnauer's new display uses multi-color display technology. The User Interface (UI) is designed with the following considerations:

- Multi-color display for easier reading
- Color is used to indicate the stage of the cycle
- Easy operation
- Quick access to important information
- Multiple languages
- Built-in view of historical cycle data
- Graphical display of Temperature and Pressure

### Documentation Package

An optional full documentation package is available:

- Preliminary Installation Qualifications (IQ)
- Preliminary Operation Qualifications (OQ)
- Preliminary Performance Qualification (PQ)



## Cycle Programs

- Pre and Post Vacuum control (optional)
- Up to 30 cycle programs (preset programs according to selected options)
- Cleaning cycle for cleaning piping (optional)
- Material Stress cycle (optional) for testing various materials (multiple cycles and long sterilization time - 24 hours, 48 hours, 72 hours, and longer)
- Enable/disable cycle programs according to user needs



## Connection Types for Accessories



USB port for external memory devices



Barcode via USB (optional)



Ethernet communication port

## R.P.C.R (Remote PC Reporting)

PC software for generating reports (optional)

### Available View of Reports and Graphs:

- Graph of the cycle data
- Numeric data of the cycle
- Copy of cycle print-outs
- Table of all measured values
- Table of all parameters
- Option to save all reports in pdf file format

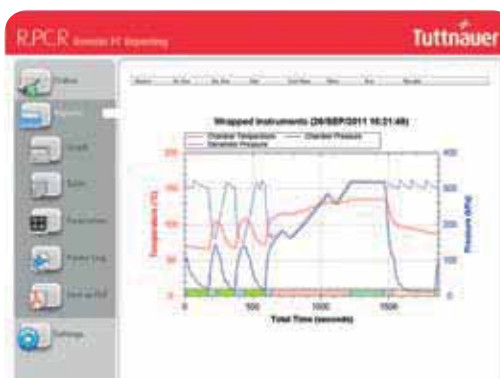
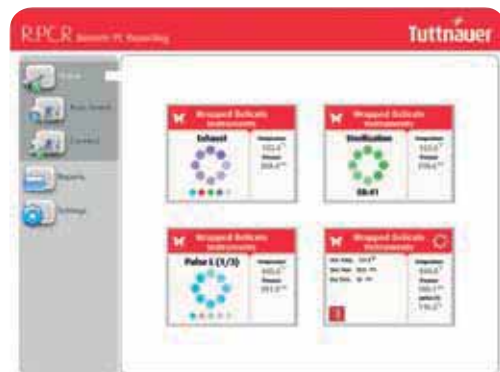
The software allows 2 modes of operation:

### Online mode

Up to 8 autoclaves may be accessed using a PC within an organization via an Ethernet connection. These autoclaves can each be remotely monitored at the same time showing all reports and graphs. History files are automatically downloaded from the autoclave.

### Offline mode

Data is transferred from the autoclave using a standard USB memory device. This data can then be viewed with the report generator software on a PC.



# Liquid Loads

## Liquid Load Fast Cooling Applications

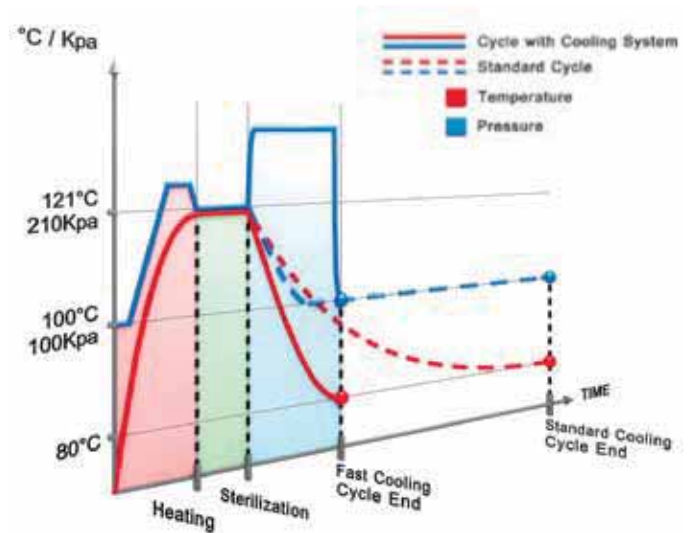
Sterilizing liquid requires longer heating and cooling times for completing a cycle, especially with sensitive liquid loads. When time is critical, advanced optional fast cooling features are available with Tuttnauer's laboratory autoclaves that prevent a sudden drop in chamber pressure which can cause liquids to boil over.

## Fast Liquid Cooling

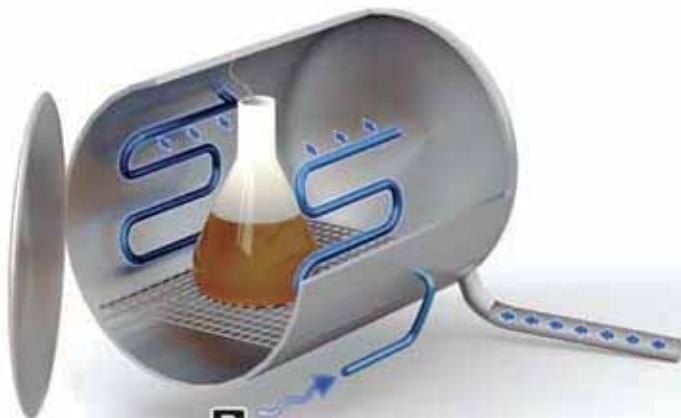
After sterilization is completed, compressed air is passed through a microbiological filter into the autoclave chamber in order to prevent a drop in pressure which also prevents load deformation, cracks or spills. Cold water is then circulated through cooling pipes that rapidly reduces the chamber temperature and that of the liquid load to a safe temperature.

**Tuttnauer's fast liquid cooling technology reduces cycle time by as much as 75% and minimizes load exposure to high temperatures.**

Fast Cooling Graph



## Benchtop ELC Models



Compressed Air Inlet  
Chamber is Pressurized

**A**

**B**  
Cold Water Inlet  
Chamber Temperature  
is Reduced

## Vertical ELVC Models



**A**  
Compressed Air Inlet  
Chamber is Pressurized

**B**  
Cold Water Inlet  
Chamber Temperature  
is Reduced

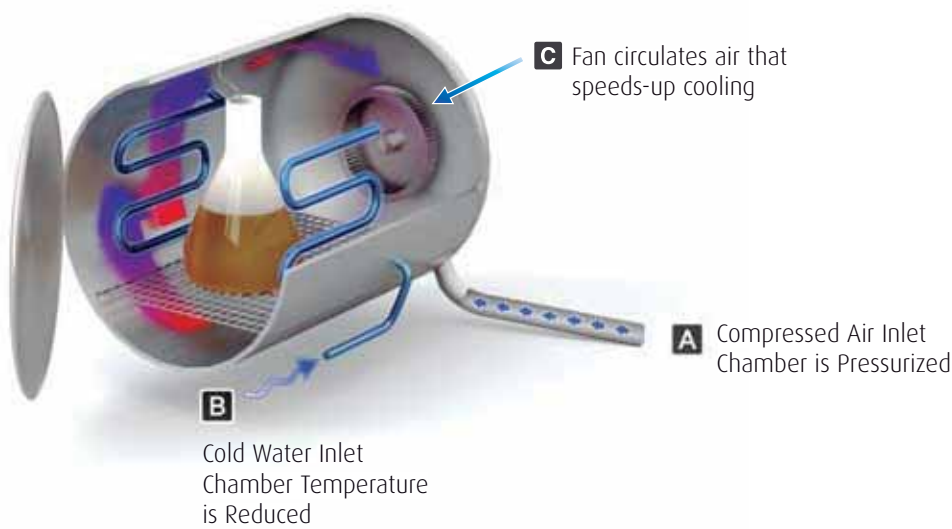


## Super Fast Liquid Cooling

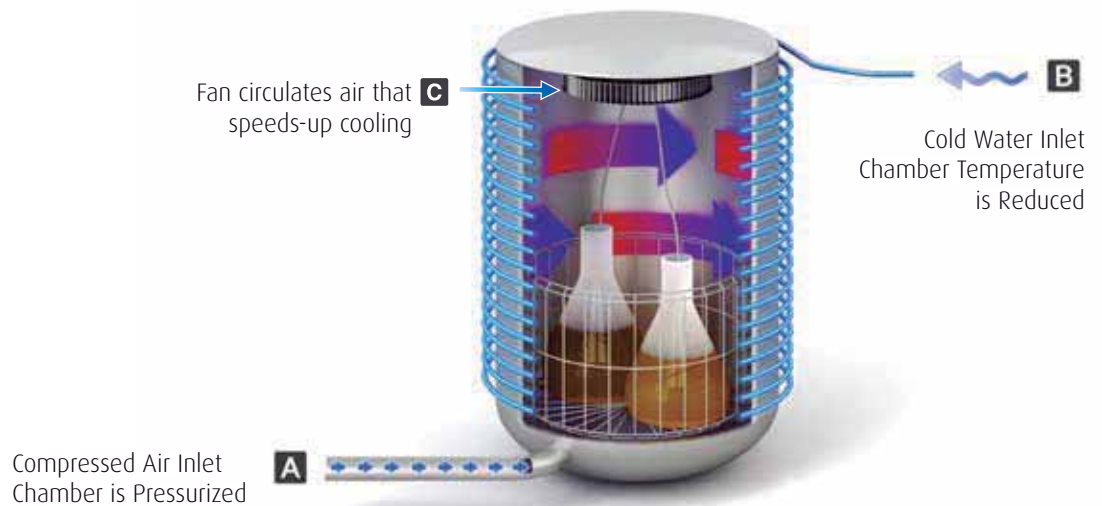
In addition to fast cooling, an optional fan can be applied to further circulate the compressed air in the chamber. This speeds up the heat exchange during the cooling stage in order to safely achieve super fast cooling of the liquid load under pressure.

Tuttnauer's accelerated fast liquid cooling technology reduces cycle time by as much as 90% and minimizes load exposure to high temperatures.

### Benchtop ELC Models



### Vertical ELVC Models



## F<sub>0</sub> – Protect Your Liquid Media, Save Time, Save Energy

An additional challenge with liquid sterilization is the need to prevent extended exposure of liquid media to high temperatures which may harm the quality of the liquid media. The advanced F<sub>0</sub> optional feature assists in minimizing the time liquids are exposed to high temperatures during sterilization thereby protecting liquid media, saving your laboratory time and reducing energy consumption.

# Glassware, Hollow and Tip Applications

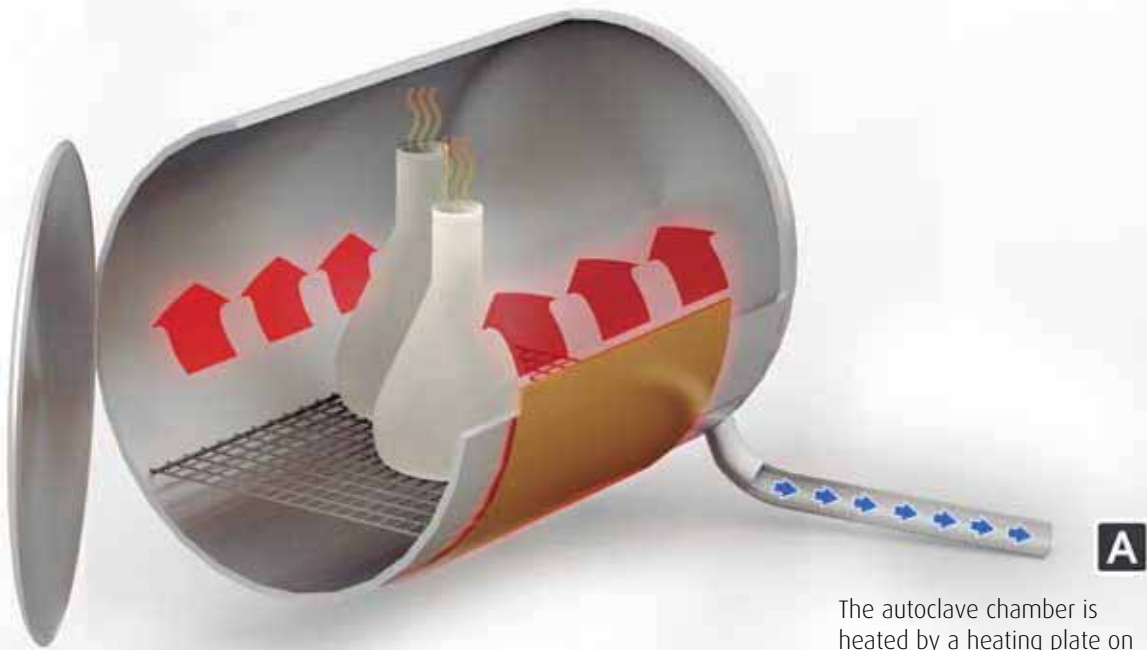
Efficient air removal is an important requirement for sterilizing hollow loads such as laboratory glassware and tips where the standard gravity displacement air removal method is not effective. Air removal after sterilization also assists in fast drying of your laboratory glassware.

## Efficient Air Removal

An optional vacuum pump can be used for fractioned pre vacuum air removal eliminating air pockets from all load types and maximizing efficient steam penetration throughout the entire load.

## Active Drying with Post Vacuum

For benchtop autoclaves, an optional vacuum pump can be used for post vacuum drying, at the end of the sterilization cycle, ensuring improved drying of porous loads and hollow instruments such as pipette tips. The benchtop autoclave is equipped with a heating plate attached under the chamber that heats the chamber during the drying phase. The low pressure in the autoclave chamber, caused by the vacuum, reduces the boiling temperature forcing moisture to evaporate rapidly. The vapour is then removed from the chamber by vacuum resulting in a dry load.



The autoclave chamber is heated by a heating plate on the outer chamber wall.

## Vacuum Pump

- used for pre-vacuum air removal
- used for post-vacuum moisture removal for fast drying



## For Applications that Need High Performance

Tuttnauer's high performance laboratory autoclaves are equipped with the following optional features: a built-in steam generator, a vacuum pump and a coiled pipe around the chamber. These autoclaves provide efficient heat-up and complete drying.

### Fast and Efficient Heat-up

#### Immediate Steam and Efficient Air Removal

During the heat-up phase air is efficiently removed from the chamber by a strong vacuum pump. Steam, that is immediately available from the built-in steam generator, is then injected into the autoclave for immediate chamber heating.

### Complete Drying

#### Chamber Heating and Post Vacuum

Highly efficient drying is achieved by uniformly heating the chamber wall of the benchtop or vertical autoclave. The chamber is heated by passing steam through a coiled pipe around the chamber. The post vacuum stage reduces the boiling point which speeds up drying. This results in faster and complete drying, and guarantees that even the most difficult loads such as textiles, porous loads, hollow instruments and tips, will dry.

### Benchtop EL Models



**B**  
The autoclave chamber is heated by injecting steam into the coiled pipe around the chamber.

**A**  
**Moisture Removal with Vacuum Pump**  
Low pressure results in low boiling point and fast drying.

### Vertical ELV Models



**B**  
The autoclave chamber is heated by injecting steam into the coiled pipe around the chamber.

**A**  
**Moisture Removal with Vacuum Pump**  
Low pressure results in low boiling point and fast drying.



**Integrated Steam Generator**  
Integrated steam generator for vertical and benchtop autoclave models

## Biohazard and Waste Sterilization Features

Many laboratories work with biohazard media that can be dangerous to laboratory staff and the environment. The advanced laboratory autoclave line provides an optional sterilization solution for the treatment of biohazard media. Prior to sterilization, during the air removal stage, all effluent is passed through a 0.2 µm biological filter that filters the exhaust air. During the sterilization stage condensate does not leave the autoclave chamber where it is sterilized. The biological filter is also sterilized during the sterilization stage. Laboratory staff and the lab environment are protected from risk of contamination. Tuttnauer provides solid waste containers for holding waste during the sterilization cycle.

### Air Removal and Heat-Up Stage

During air removal the chamber air is passed through a biological filter and leaves the autoclave as sterile air.

### Sterilization Stage

No Exhaust.  
The load is sterilized.  
The biological air filter is sterilized.

### Cooling and Exhaust Stage

Load, effluent and air filter are sterile.

### Cycle End



## Isothermal Processing

For Agar Preparation

Optional isothermal cycles are typically used for preparing agar and other biological media. Tuttnauer offers a flexible isothermal cycle with a temperature range from 60°C to 105°C that allows for gentle heating and cooling down of agar.



## Safety

Your safety is an important factor. Tuttnauer autoclaves provide safety features that ensure a trouble free work environment.

### Door Safety

The laboratory autoclaves are designed with a number of independent mechanical and digital safety features.

- A safety device prevents the operator from opening the door when the chamber is pressurized
- Steam will not enter the chamber when the door is open
- A cycle cannot start if the door is open or not properly locked
- The door cannot unlock until liquid temperature reaches the predetermined end temperature
- The door cannot unlock until chamber pressure reaches room pressure

### General Safety Features

- Double Independent Monitoring: The combined electronic and mechanical monitoring ensures that the operator has two independent means to monitor pressure
- Safety Valves: The chamber is equipped with safety valves - if the pressure exceeds the allowed limit, the safety valves will discharge
- Built-in Steam Generator Safety: A water level monitoring system maintains a constant water level and ensures safe operation of the heaters



## Standards

Our high quality laboratory autoclaves are designed to comply with the strictest international directives and standards.

- DIN 58951-2:2003 Steam Sterilizers for Laboratory Use

### Directives & Guidelines:

- Pressure Equipment Directive – PED 97/23 EEC
- EMC Directive 89/336 EEC
- RoHS Directives – 2002/96 EEC
- Low Voltage Directive 73/23 EEC
- Machinery Directive 2006/42

### Safety and EMC Standards:

- IEC/UL/EN 61010-1, IEC 61010-2-040, EN 61326

### Pressure Vessel and Steam Generator Construction Standards:

- ASME Code, Section VIII, Division 1, Unfired Pressure Vessels
- ASME Code, Section I, for Boilers
- EN 13445:2009 for Pressure Vessels
- EN14222:2003 and EN 12953 for Steam Boilers

### Good Practice Standards:

- ISO 17665-1 and ST79

### Quality System Compliance:

- ISO 9001:2008 (Quality Systems)
- ISO 13485:2003 (Quality Systems for Medical Devices)
- 21 CFR 820

## Codes for Main Optional Features

All Tuttnauer advanced laboratory autoclaves are equipped with an advanced control system and multi-color display panel. Optional advanced features are described by the following codes for EL (front loading) and ELV (vertical loading) autoclaves:

Feature Code	Feature Name	Feature Description
<b>C</b>	Fast cooling (up to 75%)	Water circulation through cooling pipes cools chamber
<b>C + F</b>	Super fast cooling (up to 90%)	Water circulation through cooling coils and air ventilation with fan rapidly cools chamber
<b>PV</b>	Efficient air removal Efficient moisture removal	Efficient air and moisture removal by vacuum pump
<b>G</b>	Efficient heating	Efficient heating by steam from steam generator
<b>PV G</b>	Complete drying	Steam from generator in combination with vacuum for complete drying
<b>BH</b>	Biohazard and Waste System	Biohazard filtration of air removed from chamber before sterilization. Also used for waste sterilization.

## Baskets and Containers

Stainless steel wire baskets and containers in different sizes for all autoclave models.

### Vertical Baskets



### Benchtop Baskets



## Value Added Features

Features for your convenience and the autoclave's durability have been engineered to operate the autoclave with complete peace of mind.

### Quality Features

- **Fast Heat Up for Shorter Cycle Times:** The vertical autoclave has a stand-by mode where chamber temperature is maintained ensuring zero wait time between cycles. This feature significantly reduces heat-up time and prevents the formation of condensate in the chamber.
- The autoclave automatically switches to standby mode if it is not operated for four hours
- **Drain cooling:** The autoclave has a built-in system for cooling waste before it reaches the drain
- The autoclave automatically switches to standby mode if it is not operated for four hours

### Lifting Device

The lifting device assists in easy loading and unloading of heavy items. The lifting device is attached to the autoclave and is equipped with an integrated swivel arm for maximum maneuverability. It is also equipped with an electronic remote control for smooth handling of all load types.



# Your Sterilization & Infection Control Partners

## Company Profile

For over 85 years, Tuttnauer's sterilization and infection control products have been trusted by hospitals, universities, research institutes, clinics and laboratories throughout the world. Supplying a range of top-quality products to over 100 countries, Tuttnauer has earned global recognition as a leader in sterilization and infection control.

## Global partnerships

At Tuttnauer we feel that business means people dealing with people. We pride ourselves on our reputation for having long-lasting relationships with our customers, spanning over decades and distances and for building solid, long-term relationships based on commitment and trust.

## Our Flexibility is Your Advantage

Beyond our unmatched range of products, we also manage complete turnkey solutions, including planning, design and installation of equipment, as well as consultation and feasibility studies, for projects of all sizes.

## More from Tuttnauer:

Featuring Tuttnauer's range of cleaning, disinfection and sterilization solutions



T-Max Line of Large Sterilizers



Washer disinfectors for hospitals and laboratories



PlazMax Line Low Temperature Sterilizers



Pre & post vacuum tabletop sterilizers designed to perform class B cycles

## Laboratory Line

### International Sales and Marketing

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