Sterilizers for the pharmaceutical industry, research and laboratories

Flexible solutions
for unique applications

MMM.
Protecting
human
health.

MMM sterilizers –

individual in design, equipment and processes

Each application area of a sterilizer is **unique** – be it in the microbiological laboratory, in animal houses or the development and production of the pharmaceutical industry. This is why MMM equipment is individually adapted to the special requirements of our customers and offers maximum safety, reliability and convenience.

In **personal** consultations, we develop solutions in which every detail is the perfect response to the special needs of our customers. MMM sterilizers have a highly modular design so that each piece of the equipment, such as the size and surface characteristics of the pressure vessel, pipe quality, fittings, sensors etc., can be individually selected according to the purpose of the application.

A **variety** of sterilization processes are available for the resource-friendly and safe sterilization of a wide range of products. The settings for each type can be adjusted for temperature, time, pressure and pressure change speed to take into account the unique material properties of the different products to be treated.

Naturally, all MMM sterilizers in the laboratory, as well as the pharmaceutical area, meet all the relevant quality requirements (e. g. pressure vessel directive, machinery directive, DIN 58951, DIN 58950, GMP, cGMP, GAMP, FDA CFR21 Part 11).

Sustainable by design – long service life and resource-friendly

MMM products are distinguished by their relevance throughout the complete product life cycle. This is ensured by solid, first-rate workmanship with a high level of production depth "Made in Germany", as well as sophisticated control systems which fulfil the highest requirements. Top quality materials are used at MMM on state-of-the-art machinery. Qualified staff and process-oriented quality assurance guarantee consistently high standards.

The MMM sustainability concept conserves the environment even in everyday business operations. Only water is used as a sterilizing medium for steam or hot water sterilization. To conserve this precious resource, MMM sterilizers can be equipped with energy recovery systems which reduce the consumption of cold water by as much as 95%.

Continuous product development and upgrade packages for older machines ensure that MMM sterilizers always remain up to date. A real investment in the future.

The perfect process for each application

The following processes are primarily used in the laboratory and industrial area:

Saturated steam process

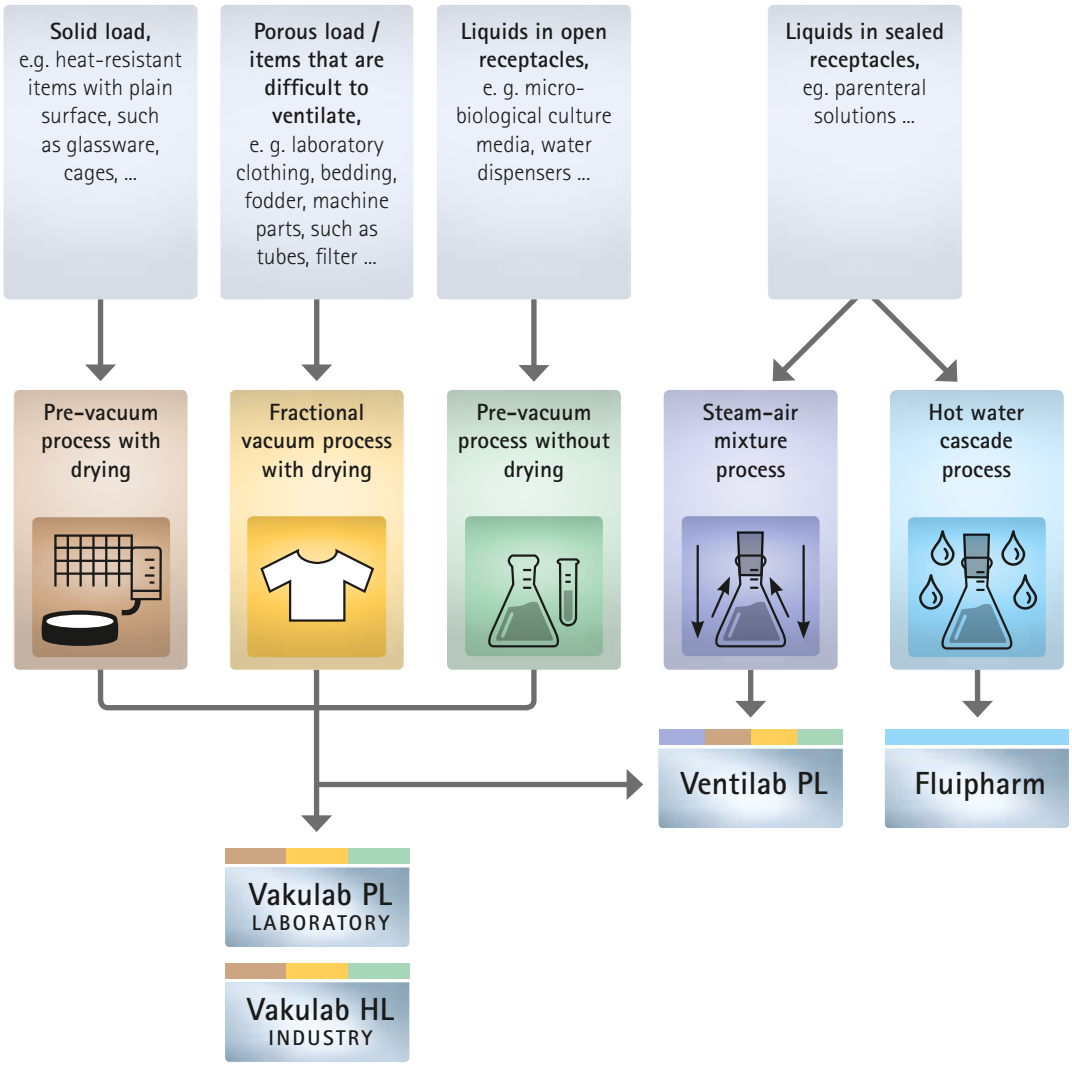
- Pre-vacuum process with drying (for solid products)
- Fractional vacuum process with drying (for porous products)
- Pre-vacuum process without drying (for liquids in open or loosely closed receptacles)

Steam-air mixture process

for liquids in sealed receptacles

Pre-vacuum process without drying

for liquids in sealed receptacles



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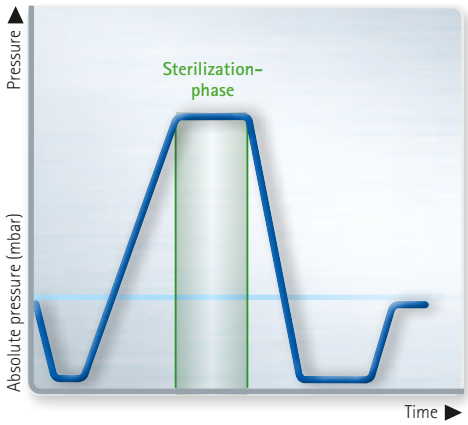
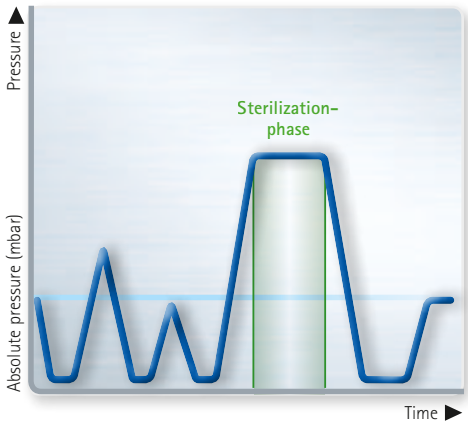
Pre-vacuum process with drying

Solids with simple surfaces (such as instruments, cages, glassware etc.) are efficiently and effectively sterilized with pre-vacuum processes. Firstly, the air is removed from the chamber and then the saturated steam is fed in until a specified sterilizing pressure has been reached. After the sterilization phase, the treated product is dried by vacuum. The temperature range for the sterilizing phase can be set between 105 °C and 134 °C.



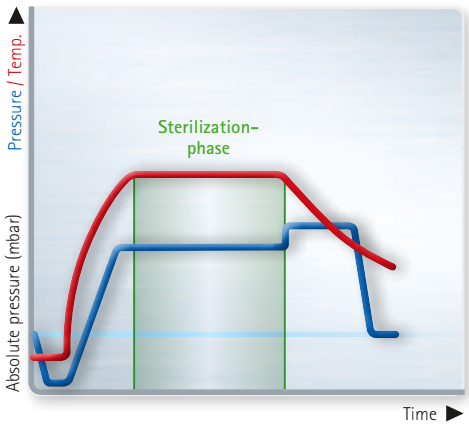
Fractional vacuum process with drying

For products with porous surfaces (such as laboratory clothing, filters, long pipes, bedding, animal food sacks etc.), which are **difficult to ventilate,** the fractional vacuum process is suitable. The air can be very efficiently removed by repeated vacuum extractions combined with steam blasting. The drying phase can also take place in several fractionations if required. The temperature range for the sterilizing phase can be set between 105 °C and 134 °C.



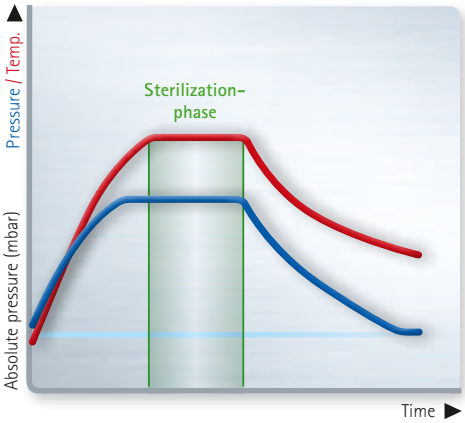
Pre-vacuum process without drying

Liquids in open or loosely sealed receptacles (such as culture media, water dispensers etc.) can also be sterilized quickly and effectively with the simple vacuum process. The temperature range for the sterilizing phase can be set between 105 °C and 134 °C. Then the product is cooled down to below 80°C using active jacket cooling. At the same time, a cushion of compressed air prevents the liquid from boiling over or the vessels from rupturing.



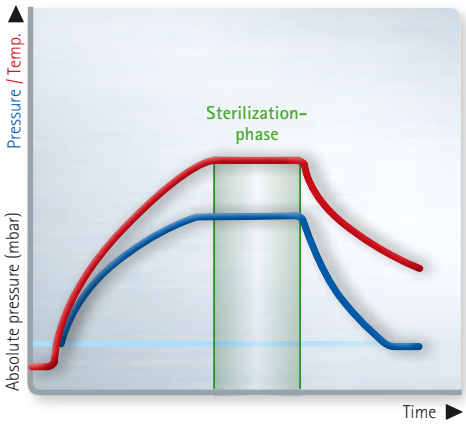
Steam-air mixture process

One particular challenge for the process control is posed by **sterilizing liquids in sealed receptacles.** The pressure inside tightly sealed receptacles rises significantly due to the liquid expanding in the heating phase. To prevent the receptacle from distorting or rupturing, compressed air is used to build up a cushioning pressure in the chamber corresponding to the pressure inside the container. A mixture of steam and air is used as a heat transfer medium. To improve the heat transfer and achieve an even temperature distribution, the mixture of steam and air is continuously circulated in the chamber using a fan. The fan is powered seal-free and seamless via magnetic coupling.



Hot water cascade process

As an alternative to the steam and air mixture, liquids in sealed receptacles can be sterilized using the direct hot water cascade process. This is particularly used in situations where liquids in sealed receptacles (such as blood bags, vials etc.) need to be sterilized in large numbers in a resource-friendly manner and quickly. Firstly, the sterilizing chamber is filled with water up to a set level. This is pumped through a steam-heated heat exchanger and sprayed over the products to be sterilized at a steadily rising temperature. A support pressure built up by compressed air provides a protective cushion which counteracts any deforming or rupturing of the receptacles. In the final cooling phase, the sterilizing water flows through a water-cooled heat exchanger and cools the sterilized products at a temperature which gradually falls to under 80°C.



Sophisticated concepts –

from start to finish

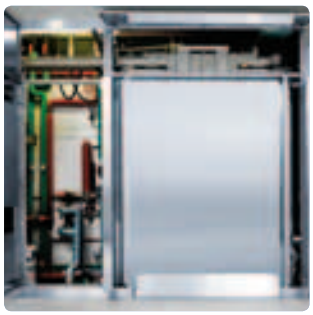
Convincing construction design

All the functional benefits are evident once the sterilizer has been installed in the workflow at the place of operation. However, it is often the transport which presents the first hurdle. This is why we at MMM have also considered the transport, assembly and the workflow on-site.

The frame of MMM sterilizers can be transported in single parts through narrow corridors and gangways and assembled at the place of operation. Its compact design is content with an installation width of just 1600 mm, and that is without an additional maintenance duct. As the access to the equipment compartment is from the front, it is also easy to install a mounting clip. All model sizes are available with single or twin doors. Large capacity sterilizers are designed to be loaded at ground level. Any uneven floors at the installation site can be compensated by the levelling lining frame.

Simple installation

- Split transport
- Low space requirement due to compact design
- Ergonomic working height
- Service-friendly front-side maintenance access
- Single and twin door models
- Levelling lining frame



Customized sterilizing chamber

The central component of every steam sterilizer is the sterilizing chamber. The interior walls of the cubic pressure vessel from MMM are made of stainless steel (1.4404 / AISI 316L) with peripheral ring channels as jacket (1.4571 / AISI 316Ti). MMM designs their own pressure vessels and manufactures them in their own production plants.

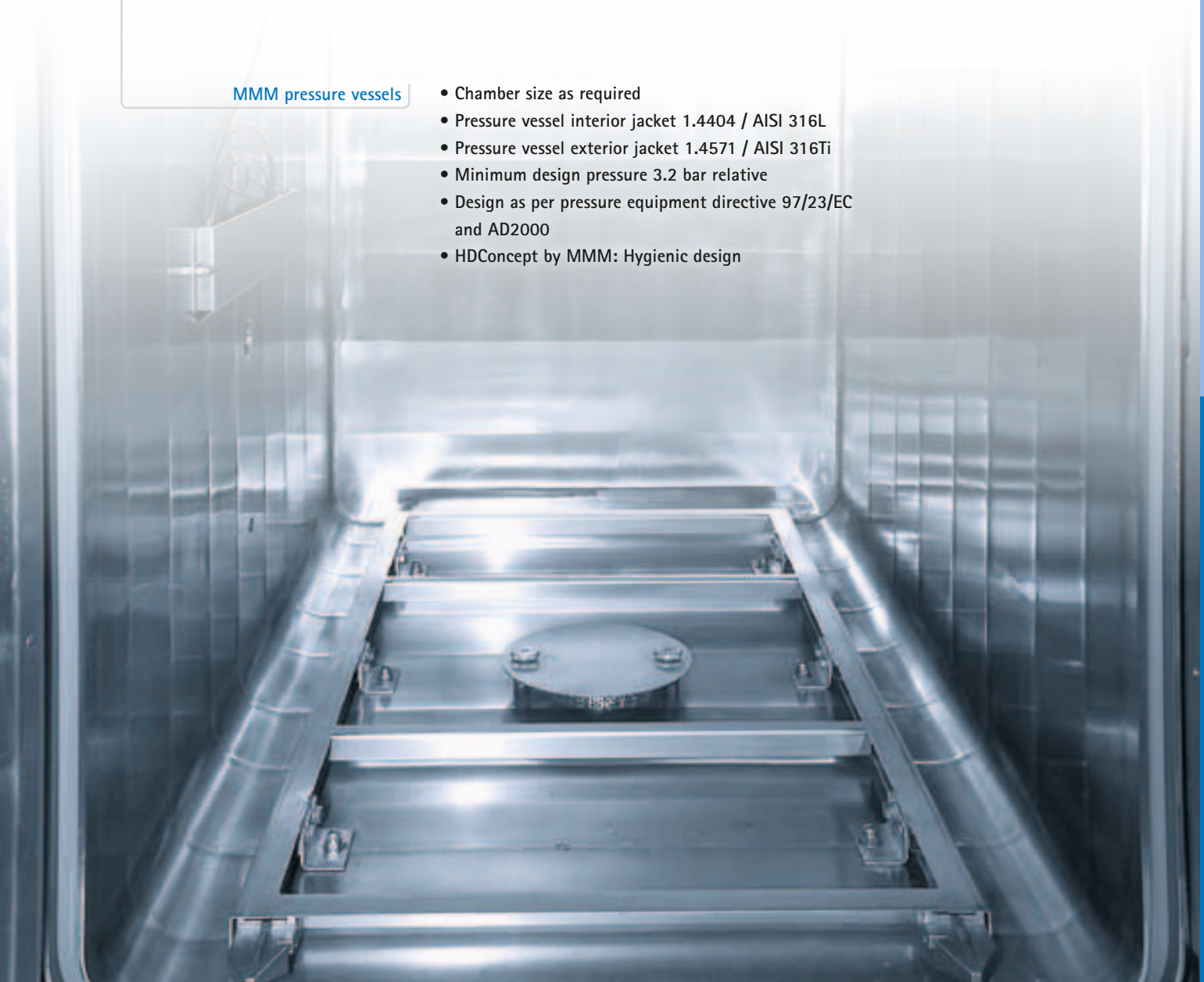
The chamber surfaces are either ceramic blasted or polished (example grain size Ra 0.8 µm) depending on the application purpose. They can also be electropolished if required. The pressure vessel is designed for a relative excess pressure of minimum 3.2 bar. Higher pressures are also possible, depending on the size of the chamber or the purpose (e. g. 143 °C program).

Hygienic design for the highest requirements
For extremely challenging application purposes, such as manufacturing sterile products in the pharmaceutical industry, all the chamber components, or only those requested by you, are designed in accordance with the HDConcept by MMM (hygienic design). This means that the chamber nozzles to the interior jacket of the pressure vessel are fitted with clamp connectors according to DIN 32676 / ISO 2852.

Horizontal chamber nozzles that are not flushed have a 3° slope towards the chamber to ensure the required draining. Pressure sensors, pressure switches and manometer with a direct connection to the interior chamber jacket are equipped with hygienic, front flush measuring membrane and temperature resistant membrane pressure sensors. The pressure sensors and pressure switches are certified by the European Hygienic Engineering and Design Group (EHEDG) (hygienic design). The pressure sensor for oil is suitable for foodstuffs with FDA approval.

MMM pressure vessels

- **Chamber size as required**
- **Pressure vessel interior jacket 1.4404 / AISI 316L**
- **Pressure vessel exterior jacket 1.4571 / AISI 316Ti**
- **Minimum design pressure 3.2 bar relative**
- **Design as per pressure equipment directive 97/23/EC and AD2000**
- **HDConcept by MMM: Hygienic design**



Doors and locking mechanism

The automatic doors are equipped with a safety system of double pressure sensors and position switches which prevent the electrically driven sliding doors from opening while the program is in operation or under pressure. The touch-sensitive safety bar provides protection from clamping – whether it is the operator or a product to be treated obstructing the door track.

The doors are sealed with a silicone sealing cord (FDA-compliant), which is applied with sterile-filtered compressed air or sterilization steam. The process-driven media selection for applying the door seals for MMM sterilizers has two advantages: The compressed air used for liquids programs increases the service life of the seal due to the lower thermal load, while the steam applied for vacuum programs offers more safety in the procedure if there are any leaks. Should the steam pressure ever fail, the system automatically changes to compressed air to prevent the pressure from leaking out of the chamber in each case.

For liquids processes, extra temperature sensors and a minimum cooling time monitored by the software ensure that liquids are cooled down to 80 °C before the door can be opened.

Safety first

- **Door safety system: no opening under pressure and no closing if an obstacle is in the way of the door track**
- **Interior door panel made of 1.4404 (AISI 316 L)**
- **Reinforcement channel made of 1.4571 (AISI 316 L)**
- **Door seal application with steam or pressurized air**

Air-tight partition with dual function

The sterilizer usually separates the non-sterile area from the sterile area. To prevent any air exchange between these two sensitive areas, the sterilizer is fitted with an airtight partition in the equipment compartment. Opening both chamber doors at the same time is prevented by the controls. At least one of the doors is always under pressure thereby ensuring the separation remains airtight even when the machine is switched off.

Depending on the installation site at the customer, the door controls can be configured so that the sterilizer's sluice function is optimally achieved. The freely-configurable controls enable the settings to be flexible and make, for instance, the door open at the end of the program. Operating errors are ruled out. Even if the sterilization direction changes. All this is set by parameters – without any modification of the software.

Airtightness

- **Air-tight partition, available in stainless steel 1.4301 (AISI 304)**
- **Chamber as sluice**
- **The two doors do not open simultaneously**
- **Partition in soundproof design (approx. 40 db)**
- **High degree of safety: Automatic switching the door seal medium to maintain the effects of the partition in case of pressure drops.**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MMM Group

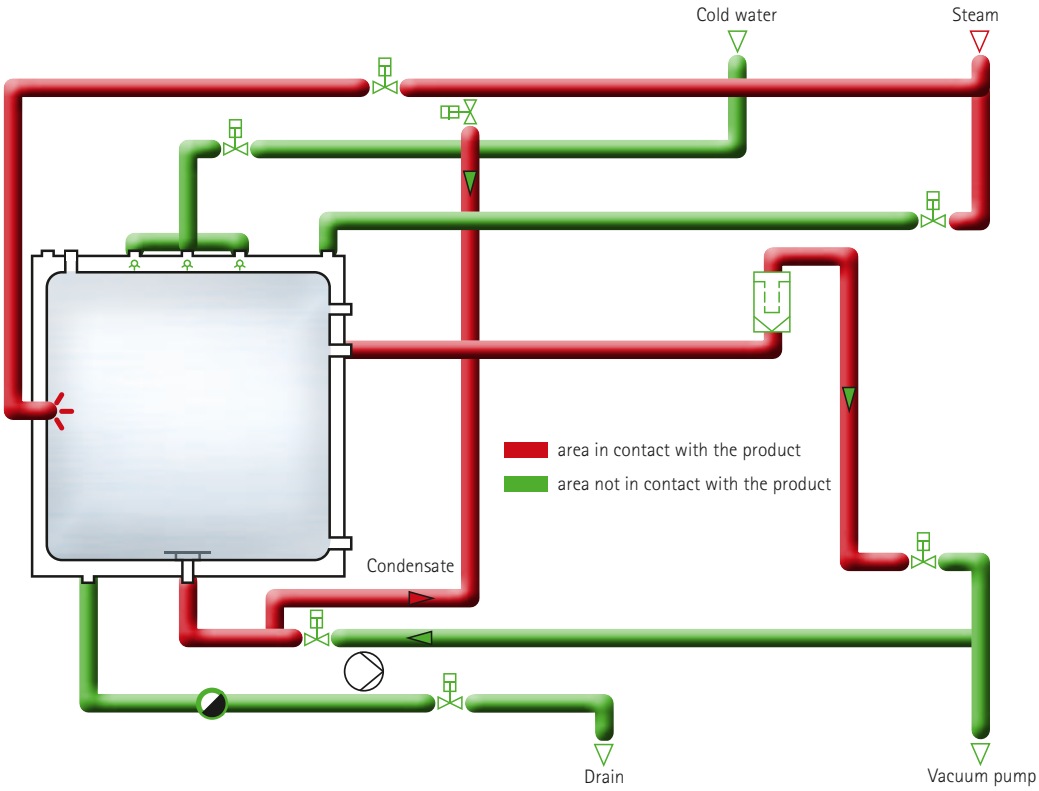
SANIcirc – pipes that make a difference

Pipes, valves, connectors, seals etc. with direct contact to the sterilizer medium have an immediate impact on the outcome of the sterilization. The more valuable and sensitive the treated product is, the more important the quality of the components in the model. This is why we at MMM first make a distinction between the area which comes into contact with the product and the area which does not. The area in contact with the product includes all areas of the unit that are either directly or indirectly in contact with the product via the media, such as sterilization steam, sterilization water, compressed air or completely desalinated water. The area not in contact with the product refers to all media areas of the unit that are neither directly nor indirectly in contact with the product, such as condensate cooling, cooling cycle, vacuum pump unit etc.

According to this distinction, the quality of the individual components can be selected as required. The pipe classes defined by MMM help to identify the right combination of material and equipment. All pipes in MMM sterilizers are laid at a slope to allow them to drain. Wherever possible, the weld joints are executed as orbital welds.

The pipe insulation is colour-coded according to the flow medium so that it is possible to see at a glance whether a cold or a hot medium is being used. All materials for the insulation are free of asbestos. Optionally, the insulation can be realized by a sheet metal sheath. It reduces the loss of heat to a minimum.

Display of pipe classes using examples of sterilized steam, condensate and exhaust air.



Extract of MMM pipe classes

MMM pipe classes *		K10	H10	H14	H20
Optional for product contact area		0	1	1	1
Optional for non product contact area		1	1	0	0
Ducts	Material	Copper	1.4404	1.4404	1.4404 / 1.4435
	Interior surface	-	-	-	Ra < 0,8 µm
Valves	Valve type	Inclined valve	Inclined valve	Inclined valve	Inclined valve
	Material	Red brass	1.4408	1.4408	1.4435
	Interior surface	-	-	-	Ra < 0,8 µm
Connections	Pipe / pipe	Sleeve + hard soldering	Weld ends	Weld ends	Weld ends
		O-ring-screw fittings	O-ring-screw fittings	Clamping connection DIN 32676 / ISO 2852	Clamping connection DIN 32676 / ISO 2852
	Pipe / fitting	Hard soldering	Weld end	Weld end	Weld end
		Thread (sleeve/ nipple)	Thread (sleeve/ nipple)	-	-
		O-ring screw fittings	O-ring screw fittings	Clamping connection DIN 32676 / ISO 2852	Clamping connection DIN 32676 / ISO 2852
Seals	O-ring	Viton	Viton	EPDM FDA-compliant	-
	Clamp seals	-	-	EPDM FDA-compliant	EPDM FDA-compliant

Other individual adaptations are also possible.

SANIcirc – impeccable hygiene

- Pipes with slopes for reliable draining
- Quality adapted to customer requirements
- Colour coded pipelines
- Asbestos-free insulation
- Also available in halogen-free design

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Effective cooling

For reasons of safety, sterilized liquids may only be removed from the chamber once their temperature has fallen down to below 80 °C. Various methods are available to do this depending on the application.

Passive cooling – natural cooling

If you only sterilize liquids occasionally it is preferable to leave it overnight, without using any other medium to cool it down to the required temperature. This takes time but not resources.

Active cooling – jacket cooling

If the cooling process needs to be accelerated, softened cold water is fed into the pressure vessel jacket during the cooling phase in a temperature-controlled manner. This cools the chamber and treated products down to the required temperature. The cooling time is reduced considerably.

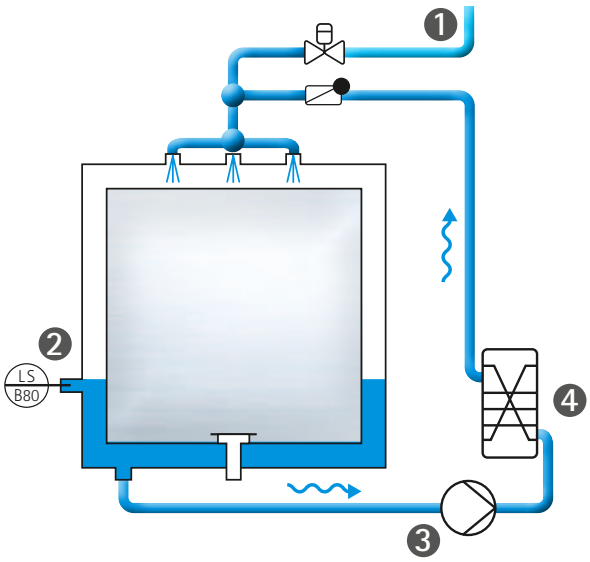
Circulating jacket cooling

The use of cold water for jacket cooling can be drastically reduced if the cooling water is re-cooled when circulating. Here, the cooling water is filled up only once and is circulated past a water-cooled heat exchanger by pump and cooled.

Cooling circuit on-site

You can save even more cold water if the cooling of the heat exchanger as well as the condenser cooling of the vacuum unit are connected to a cooling circuit on-site. You reduce your water consumption by up to 95%.

1. Softened water as cooling agent for the jacket
2. Level switch
3. Circulation pump
4. Water cooled heat exchanger



Benefiting from saving potential

- **Short cycle times: active jacket cooling for products sensitive to temperature**
- **Efficient: Circulating jacket cooling reduces the softened water consumption up to 90 %**
- **Sustainable: Cold water can be saved by up to 95 % when connecting a cooling circuit on-site**

Clear process documentation

To record the successful sterilization, the batch data is firstly saved locally in the sterilizer. The process documentation contains all the relevant information required for standard documentation: program name, batch number, sterilizer temperature, pressure, start and end of the process etc. Pressure and temperature are also displayed as a graph in colours. For long-term archiving, the batch data can be transferred to an external PC using an on-site network. Nothing will be lost in the process. In the event of a power failure, files are automatically transferred as soon as the network is up and running again.

Nothing will be lost

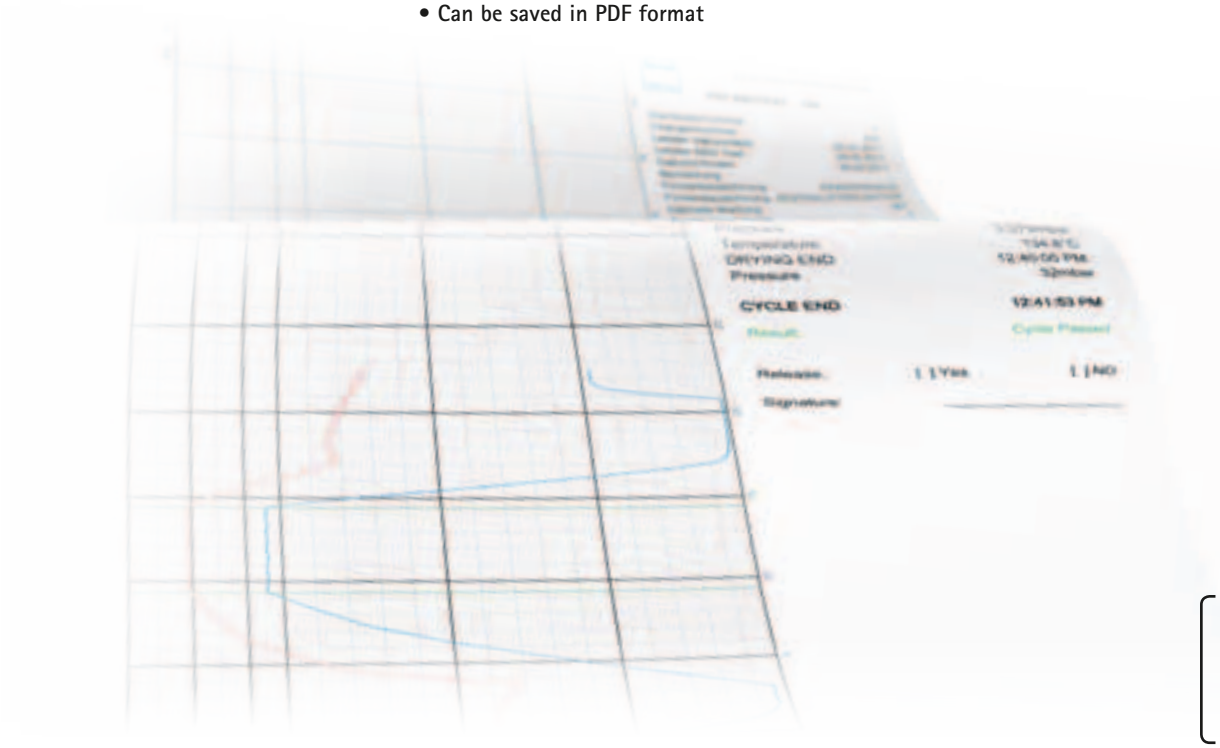
- **Process log with plain text and colour graph display**
- **Cycle logs can be printed using a built-in printer or a DIN A4 colour printer**
- **Zero voltage-resistant data storage in the controls**
- **B&R controls: At least 15,000 batches can be saved on the plug-in compact flash memory card**
- **Optional: Network storage for back-up data archives**
- **Siemens controls: Direct transfer of batch data to external PC**

Safety first

We have included a suitable software package for processing your batch data: With **SimServ,** the batch data is stored on an external computer as a file and is available for a variety of operations with **Chargen Viewer.**

Available anytime

- **Long-term archiving of batch data as files**
- **Can be reproduced anytime**
- **Can be subsequently viewed and evaluated**
- **Can be exported to Excel**
- **Can be saved in PDF format**



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The controller

The controller is the intelligent brain of a sterilizer. The strings are pulled here; everything comes together in this unit. It controls the actual process sequence.

The sensors continuously provide the controller with information about the actual state of the device (temperatures, pressures, water level, etc.) and control the desired values for the actuators such as valves, pumps and contactors which have been set during putting into service. Redundant sensors as well as the monitoring of important operational parameters provide for the highest possible process safety.

Precise process regulation

- **Sturdy and durable: established industry controller without mechanical moving parts**
- **Ethernet interface on the controller for optimal networking**
- **Redundant sensors for the highest process security**
- **PPV – Process Parameter Verification**

Flexible parametrisation

The great number of available parameters allows wide-ranging setting possibilities in order to adjust your sterilizer to current and future requirements that arise due to changes to guidelines, standards, sterilized goods or the installation situation. And all of that without software changes. In this way all the setting values that were extensively documented during putting into service remain effective.

Control System by B&R

The B&R Power Panel offers immense resources and enables extremely dynamic configurability, allowing all project-specific details to be taken into account individually. This control module demonstrates its flexibility not least through the options for printing the log. The options include a built-in printer integrated in the front of the sterilizer or a DIN A4 printer either directly connected to the controller or connected over a network.

Control System by Siemens

In the pharmaceutical sector, a Simatic Multipanel Touch from Siemens is used, which also ensures conformity with FDA CFR 21 Part 11. The underlying platform ensures the highest level of control stability and continuity. Siemens components are known throughout the world and will be available over the long term.

Everything compliant with the standards

- **Controller complies with FDA CFR 21 Part 11**
- **User management – no unauthorised access**
- **Backup restore: reliable system recovery**

The software – a clever solution

The MMM Software is validated in accordance with DIN EN 62304 "Medical Device Software – Software Lifecycle Processes" and thus fulfils the highest standards. The sophisticated parameter structure enables a high degree of flexibility in the configuration of the machine. Up to 50 programs can be configured at the same time. If the unit is not used for a long period of time, an energy-saving idle mode is activated.

We thought of everything

- **Parameter-controlled free programmability of the processes**
- **Continuous monitoring of all measured values**
- **Precise regulation of the actuators**
- **AuditTrail: Who did what, and when did they do it?**
- **Bar code reading system with automatic program selection**
- **User IDs and user management**
- **Automatic early start optimizes work time**

Making work easier: MMM Smart HMI

The human-machine interface is another component of the MMM concept for making the work of the operating personnel easier. The MMM visualization of the navigation using the colour touch display is designed in friendly colours and unambiguous symbols and text. All process-relevant information, such as device status, process step, values and graphs, is available at a glance on the 10" or 15" display. The remaining time of the program is displayed in numbers that can be viewed from a distance, allowing the workflow to be optimized without waiting times.

Operation that is more enjoyable

- **Intuitive menu guide on a colour touch display**
- **10" or 15" display**
- **Large remaining time display for optimal time management**

R&I-diagram: Clear display of the current state of all actuators and sensors

Special application

in laboratory and industry

More than just safe! Safety requirements of the sterile area in the pharmaceutical industry or in animal houses make individual solutions necessary. Safety requirements of laboratories working with infectious material are different.
MMM sterilizers offer the perfect equipment and right process for any specialized application!

Germ reduction with heat-sensitive goods

Not everything brought into the sterile area of a laboratory can withstand steam sterilization. For germ reduction, heat-sensitive goods such as vacuum-packed food or litter sacks, electrical tools, computers, microscope measuring devices, etc., are treated with hydrogen peroxide (H_2O_2) when being brought through the airlock into the laboratory. For this, the chamber of the MMM sterilizer is used as an airlock and filled with hydrogen peroxide using an external H_2O_2 generator.

Uncomplicated H_2O_2 treatment

- **Connection of an H_2O_2 generator for bringing heat-sensitive goods into and out of the laboratory through an airlock**
- **Easy operation of the MMM Smart HMI of the sterilizer**
- **Monitoring of the aeration process by the sterilizer**
- **High operational reliability through design and technical process solutions**

Hazardous goods: Infectious material

The condensate is also sterilized

The highest safety level is required when pathogenic microorganisms are to be sterilized. The condensate produced and the exhaust air are contaminated and also need to be treated before they leave the sterilization chamber. For this the condensate is collected and sterilized during the sterilization phase. To ensure that the values are maintained, the temperature in the condensate can be monitored. The exhaust air is automatically sterile-filtered during every process on an inline basis using the exhaust air filter.

Maximum safety

- **The highest possible process safety through condensate sterilization**
- **Optionally with temperature monitoring of the condensate**
- **Inline filtration of the exhaust air during every process**
- **Redundant exhaust air filters**
- **Increased design pressure of the chamber**

Waste sterilization according to RKI (Robert Koch Institute)

In many health and research institutions, wastes with the waste key 18 01 03 of the German Waste Catalogue Ordinance are accumulated. This includes wastes containing infectious blood, secretions or excretions (such as from quarantine units of hospitals, dialysis stations, pathology departments, etc.) or microbiological cultures (such as for institutes for hygiene, microbiology and virology, medical labs, etc.).

These wastes may only be disposed of in household waste if they have been previously disinfected in a process approved by the Robert Koch Institute. MMM sterilizers are listed in many different sizes in the disinfectant list of the RKI.

Infection prevention

- **Hazard-free disposal of infectious waste**
- **RKI approved process**
- **Suitable for mixed load**

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Pharmaceutical industry and more

When producing sterile goods, such as in the pharmaceutical industry, every batch is valuable. The sensitive products must be reliably sterilized, but at the same time gently treated. MMM has additional equipment components that provide assurance precisely in this area.

Sterile-filtered compressed air

During the sterilization of fluids, sterile-filtered compressed air is used in two instances: once as a medium for pressurization of the door seal and once as support pressure in order to prevent bursting of the receptacles due to pressure differences that arise during cooling. During the vacuum program, the compressed air filter is directly sterilized inline, that is, without removal of the filter cartridge, and in this way it is insured that the compressed air is sterile.

You can rely on the following

- **Inline sterilization of the compressed air filter**
- **High degree of sterilization reliability: the possibility of contamination of the compressed air is excluded**
- **Connection options for manual filter integrity test**

F_0 value

A reduced thermal load is a critical factor when producing sterile solutions.

Calculating the F_0 value

For the F_0 value calculation, the thermal effect on the fluid that arises both before and after the sterilization is calculated and documented. The current F_0 value is shown on the display during the program sequence, and the absolute F_0 reached is shown on the charge log at the end of the program.

F_0 value controlled

In order to reduce the total thermal load on the goods, the process can be controlled using an F_0 value to be achieved instead of a fixed sterilization time. This provides the gentlest possible treatment.

Minimising the thermal load

- **Online display of the current F_0 value during the program sequence**
- **An F_0 value-controlled process sequence reduces the heat input into the goods**
- **Documentation of the achieved F_0 value**

Air detector: more process safety

Air is a non-condensable gas and represents a safety risk for successful sterilization with vacuum programs. That's why the air is removed from the chamber using vacuum before steam injection in saturated steam processes. During the rest of the program sequence, the MMM air detector monitors the chamber, determining whether there is air in the chamber indirectly through temperature measurement. The result of the monitoring is documented in the batch log.

Air Free:

- **Air detection device: documented process safety**
- **Inexpensive process monitoring**
- **Monitoring during each batch**

Flexible solutions –

precisely dosed

Vakulab PL

The Vakulab PL is the all-rounder amongst the MMM steam sterilisers. The range of models is so varied and flexible that it covers an especially wide application area. Its basic model meets all the standard requirements of research laboratories, animal houses and industry with regard to quality as well as in the variety of volume available.

- Low space requirement
- Perfect sterilization for material preparation and discard
- Flexible equipment options

Dimensions table

The following chamber sizes are already available as standard at MMM. Individual sizes can also be obtained according to application specifications. All models are available with one or two doors. Unit depth for 2-door models, each + 20 mm.

Type	Clear internal chamber dimensions in mm (H x W x D)	Volumes in l	Exterior device dimensions in mm (H x W x D)
H-Models			
666	710 x 650 x 690	318	1818 x 1600 x 970
669	710 x 650 x 990	456	1818 x 1600 x 1270
969	1000 x 650 x 990	644	1818 x 1600 x 1270
9612	1000 x 650 x 1350	871	1818 x 1600 x 1620
G-Models			
969	1360 x 720 x 1090	1070	1918 x 1900 x 1390
9612	1360 x 720 x 1390	1360	1918 x 1900 x 1690
12612	1600 x 720 x 1390	1600	2118 x 1900 x 1690
12918	1360 x 1000 x 2130	2896	2118 x 2300 x 2440
141114	1550 x 1200 x 1460	2700	1918 x 5240 x 1780
181015	2005 x 1100 x 1600	3530	2550 x 3090 x 2140
181215	2005 x 1300 x 1600	4170	2550 x 3435 x 2140
V-Models			
666	702 x 652 x 690	316	1818 x 1300 x 990
669	702 x 652 x 990	453	1818 x 1300 x 1270
6612	702 x 652 x 1340	613	1818 x 1300 x 1620

Technical changes reserved.

Process options

Pre-vacuum process with drying
for solid products

Fractional vacuum process with drying
for porous products

Pre-vacuum process without drying
for liquids in open receptacles

Optional:
Steam-air mixture process
for liquids in tightly sealed receptacles
(additional feature "Sealed liquids" required)

Standards
The Vakulab PL is a laboratory steriliser according to DIN 58951-2.

Vakulab PL

Variety of equipment

- B&R control panel
- Active jacket cooling
- Circulating jacket cooling
- Connection to cooling circuit on-site
- 10" or 15" display
- "Infectious products" package
- Discard program
- Sterile filtration of the compressed air
- Air detector
- Air-tight partition
- H_2O_2 generator connection
- "Sealed liquids" package

Typical products for treatment

- Glassware
- Animal cages
- Textiles
- Bedding
- Food
- Food sacks
- Pipes
- Filters
- For liquids in open or unsealed receptacles
- Culture media
- Water dispensers

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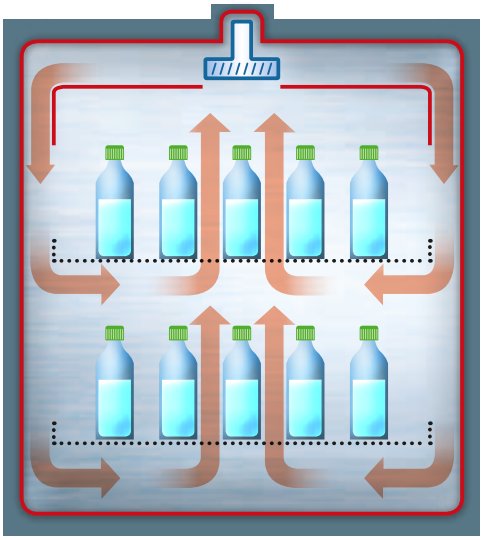
Ventilab PL

The Ventilab PL is the specialist for sterilising liquids in sealed receptacles. It differs from the Vakulab PL mainly due to a higher chamber which allows the installation of a fan without restricting the volume available. In addition, all components necessary for the sterilization of liquids in sealed receptacles such as temperature sensors, fan and software package "Sealed liquids" are already standard.

- Fan with magnetic coupling
- No restriction to the volume available, despite the fan
- High Pathogene cycle: the outgoing air is also sterilized



Dimensions table

The following chamber sizes are already available as standard at MMM. Individual sizes can also be obtained according to application specifications. All models are available with one or two doors. Unit depth for 2-door models, each + 20 mm.

Type	Clear internal chamber dimensions in mm (H x W x D)	Volumes in l	Exterior device dimensions in mm (H x W x D)
H-Models			
669	830 x 650 x 990	521	1898 x 1600 x 1270
969	1130 x 650 x 990	708	1898 x 1600 x 1270

Technical changes reserved.

Process options

Steam-air mixture process
for liquids in sealed receptacles

Pre-vacuum process with drying
for solid products

Fractional vacuum process with drying
for porous products

Pre-vacuum process without drying
for liquids in open receptacles

Standards

The Ventilab PL is a laboratory steriliser according to DIN 58951-2.

Ventilab PL

Variety of equipment

- B&R control panel
- Active jacket cooling
- Circulating jacket cooling
- Connection to cooling circuit on-site
- 10" or 15" display
- "Infectious products" package
- Discard program
- Sterile filtration of the compressed air
- Air detector
- Air-tight partition
- H_2O_2 generator connection
- "Sealed liquids" package

Typical products for treatment

- Liquids in sealed receptacles
- Liquids in open or unsealed receptacles
- Glassware
- Animal cages
- Textiles
- Bedding
- Food
- Food sacks
- Pipes
- Filters
- Culture media
- Water dispensers

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Vakulab HL

The Vakulab HL is our response to the high requirements of the pharmaceutical industry in design and process safety. Hygienic design and customer specific solutions fulfill the demanding tasks in the production of high quality sterile goods, such as parenteral solutions or syringes. Such equipment also meets the demands asked for in the sterilization of production material such as fermenters, filling systems, clean room clothing, filters, etc..

- Hygienic Design for the highest requirements in hygiene
- Flexible equipment options
- Individual construction

Dimensions table

The following chamber sizes are already available as standard at MMM. Individual sizes can also be obtained according to application specifications. All models are available with one or two doors. Unit depth for 2-door models, each + 20 mm.

Type	Clear internal chamber dimensions in mm (H x W x D)	Volumes in l	Exterior device dimensions in mm (H x W x D)
H-Models			
669	710 x 650 x 990	460	1918 x 1900 x 1350
969	1000 x 650 x 990	644	1918 x 1900 x 1350
999	1120 x 1000 x 990	1100	1998 x 2300 x 1410
G-Models			
181015	2005 x 1100 x 1600	3530	2550 x 3090 x 2160

Technical changes reserved.

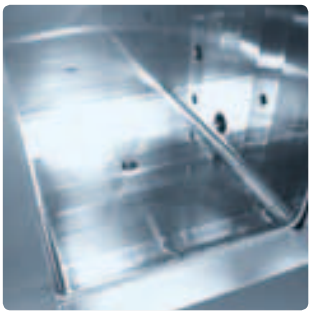
Process options

Pre-vacuum process with drying
for solid products

Fractional vacuum process with drying
for porous products

Pre-vacuum process without drying
for liquids in open receptacles

Optional:
Steam-air mixture process
for liquids in tightly sealed receptacles
(additional feature "Sealed liquids" required)



Standards
The Vakulab HL is a pharmaceutical steriliser according to DIN 58950-2.

Vakulab HL

Variety of equipment

- Siemens controls
- Clamp or aseptic screw fittings
- Sealants and lubricants according to FDA (21 CFR)
- F_0-value-controlled process sequence
- In-line sterilizable filter housing and elements
- Active jacket cooling
- Circulating jacket cooling
- Connection to cooling circuit on-site
- 10" or 15" display
- "Infectious products" package
- Discard program
- Sterile filtration of the compressed air
- Air detector
- Air-tight partition
- "Sealed liquids" package

Typical products for treatment

Filters
Machine parts
Glassware
Textiles
Pipes
Liquids
Culture media

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Fluipharm

When liquids in sealed receptacles need to be sterilized in large numbers quickly, gently and efficiently – the answer is Fluipharm!
Perfected for the use of hot water cascade process, the Fluipharm offers everything required in R&D, in the production of sterile products and also in the treatment of parenteral solutions in hospital pharmacies. For the pharmaceutical and biotech industries, fast, sterile processing is a major factor in the success of the company.

- Reliable and fast in the process sequence
- Individual design and equipment
- Special programs: testing, washing, rinsing ampoules

Dimensions table

The following chamber sizes are already available as standard at MMM. Individual sizes can also be obtained according to application specifications. All models are available with horizontal sliding door.

Type	Clear internal chamber dimensions in mm (H x W x D)	Volumes in l	Exterior device dimensions in mm (H x W x D)
H-Models			
669	710 x 650 x 990	447	1918 x 1900 x 1290
969	1000 x 650 x 990	644	1918 x 1900 x 1290
9612	1000 x 650 x 1340	871	1918 x 1900 x 1590
141114	1550 x 1200 x 1460	2700	2070 x 3250 x 2190
12918	1360 x 1000 x 2130	2897	2368 x 2500 x 2490

Technical changes reserved.

Process options

Hot water cascade process
for liquids in sealed receptacles

Optional:
Pre-vacuum process with drying
for solid products

Optional:
Fractional vacuum process with drying
for porous products

Optional:
Pre-vacuum process without drying
for liquids in open receptacles

Standards
The Fluipharm is a pharmaceutical steriliser according to DIN 58950-2.

Fluipharm

Variety of equipment

- Siemens controls
- Clamp or aseptic screw fittings
- Sealants and lubricants according to FDA (21 CFR)
- F_0-value-controlled process sequence
- In-line sterilizable filter housing and elements
- Circulating jacket cooling
- Connection to cooling circuit on-site
- 10" or 15" display
- "Infectious products" package
- Air-tight partition

Typical products for treatment

- Liquids in sealed containers
- Blood bags
- Vials
- Ampoules
- Infusions

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Sterilizers for the pharmaceutical industry, research and laboratories

MMM Group

As one of the world's leading suppliers of sterile processing systems, MMM has been working actively to promote good health since 1954. With a full range of sterilization and disinfection products and services – that can be found in every branch of healthcare from hospitals and scientific institutes, to laboratories and the pharmaceutical industry – MMM, has over the years, consolidated its position as a pioneer of quality and innovation both in the German and international market.

In our two production facilities based in Stadlern, Germany, and Brno, in the Czech Republic, we manufacture products that meet the highest demands of our customers world wide. The depth and precision of production standards at both plants ensure that we accomplish the rigorous quality requirements of medical engineering. 900 competent employees work together as a committed and enthusiastic team, dedicated to achieving the mission of the MMM Group.

Protecting human health.

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