

# System solutions for effective steam sterilization :

How compact and customized system solutions from one source can help to save space and money



**bürkert**  
FLUID CONTROL SYSTEMS

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# System solutions for effective steam sterilization: How compact and customized system solutions from one source can help to save space and money

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**Steam sterilization is the standard method used in most labs and hospitals for sterilization of medical instruments, surgical garments and dressing materials. A key factor for effective sterilization is that air in the sterilization chamber must be completely displaced by steam at the correct temperature, quality and time period. Bürkert, the fluid technology specialists, offer manufacturers of steam sterilization devices compact and customized system solutions from one source, for the regulation and control of dry saturated steam, two-phase steam and condensate.**

Complete air evacuation of the sterilizer chamber, including in and around the objects to be sterilised, is a basic prerequisite for a reliable steam sterilization process. Homogeneous temperature distribution is guaranteed only in a one-hundred percent steam atmosphere. Any air remaining in the sterilization chamber mixes with the steam, contributing to the pressure but importantly not the temperature of the chamber. An effective method for air evacuation used in modern sterilization devices is a pulsed vacuum phase, in which the air is removed from the sterilization chamber and repeatedly “jolted” from inbetween and within the objects to be sterilised.

### Compact solution from one source

For controlling these processes, Bürkert – as a specialist for fluid technology systems – developed a compact system solution on the basis of a multi-functional block design. The concept is based on several Type 2000 INOX 2/2-way seat valves - plus associated ancillaries - mounted on a multi-functional block, with space saving and flexible internal gallery layout possibilities. In the assembly of steam sterilization devices, this approach eliminates the complex and time consuming process of assembling the required valves, sensors, strainers and check valves, by means of pipe interconnections and elbows. The compact block solution saves time and costs with respect to initial outlay, installation and as well as valuable installation space. In addition to the capability of developing more compact devices, this latest system from Bürkert dispensing with external pipes, joints and connections thus offering higher functional reliability and process availability, since many potential weak spots for leaks are eliminated.



DN10 Type 2000 INOX block for sterilizer condensate management

In the sample application described below, a Type 2000 INOX block controls the connections on the bottom of the sterilization chamber. It is typical for one block mounted above the chamber to control the steam to the chamber, door seal and jacket and another block below the chamber, to control the evacuation of the chamber. In the following description, it is this essential process that the Type 2000 INOX block is controlling.

In the first process phase the air is removed from the chamber and also crucially within and around the objects to be sterilized – in this case items of a porous nature, typically surgical garments and dressings. After checking to make sure the chamber door seal is air-tight, the Type 2000 INOX valves open to allow the connected vacuum pump to evacuate the air from the chamber. Shortly afterwards they close, and steam is introduced by means of the top block and the pressure in the chamber returns to atmospheric pressures. This “saw-tooth” process is repeated several times, with the pressure in the chamber typically pulsating between 250-300 mbar absolute and atmospheric pressures. This facilitates the release of trapped air bubbles in the porous textile surfaces, between the items to be sterilized and from the far corners of the chamber. The cham-



DN20/DN25 welded solution for sterilizer steam and air management



ber or connected elements may not be completely free of leak potentials and thus it is possible that air can be drawn into the chamber by the very phases designed to remove it. This is partly why the evacuation process is repeated over several phases, including several positive pressure pulses above atmosphere.



Complete air evacuation of the sterilizer chamber, including in and around the objects to be sterilised, is a basic prerequisite for a reliable steam sterilization process

During the sterilization process the Type 2000 INOX valves on the block remain closed to keep the steam trapped inside the chamber. The steam pressure in the chamber rises to the level required for sterilization – typically 3100 mbar absolute, a temperature of 134°C. Once the required sterilization temperature is confirmed by a temperature sensor in the condensate (water) drain area (the point at which the temperature is likely to be at its lowest) the Type 2000 INOX valves remain closed and help maintain the temperature in the chamber for a period of three to four minutes.

This is followed by the drying phase, during which a low-flow Type 2000 INOX valve opens and shortly afterwards is joined by a full-flow valve in parallel, for a first gradual and then faster evacuation of the chamber. This is to evaporate off and hence dry the sterilised objects, by reducing the pressure in the chamber to below the vaporization point of any condensate present. Reduction of the pressure to typically 40 mbar absolute, ensures that all remaining moisture is returned to steam, and thus evaporated from the surface of the sterilized objects. After completion of the drying process the valves on the block close to allow the pressure in the sterilization chamber to return to the normal level by

the introduction of ambient air to the chamber. The sterilization process is then complete and the chamber door can be opened.

#### The future is modular and welded

By connecting innovative modular valve bodies by means of orbital welding, Bürkert further optimizes the concept of a complete solution for steam sterilization. The benefits of a compact, prefabricated and cost-effective system solution from one source are therefore not only sustained, but consistently developed. The very latest welded system is more flexible and more intelligent than the “traditional” single machined block solutions, whilst being more lightweight and often more cost-effective. The valve bodies can be combined with actuators from Bürkert’s Classic and Element range, which can in turn offer additional features such as position feedback and modulating control.



# Contact

Can we help you to optimise your steam sterilization processes or do you have further questions? Just contact us:

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