GEMÜ®

VALVES, MEASUREMENT AND CONTROL SYSTEMS

# Steam sterilization
## of solids

*The company Holzner plans and constructs steam sterilizers for the medical technology sector (in accordance with DIN285), in which micro-organisms are deactivated or removed due to the combined effect of steam and pressure. GEMÜ seat valves and ball valves are applied.*

*The advantages of steam sterilization are as follows:*

- *good checkability*
- *no toxicity*
- *no environmental impact*
- *no toxic residues on the sterilized product*
- *relatively favourable cost-benefit ratio*

*The plants currently under construction at the Holzner company are designated for a large pharmaceutical company and are used there, for example, to sterilize nutritive media, but also cages, animal feed and drink solutions within animal science. In this application specific requirements are set for the valves. Therefore globe valves GEMÜ 555 and in special applications globe valves with stainless steel bellows are applied - GEMÜ 505 (manuel) and GEMÜ 555 (pneumatic) - as well as check valves GEMÜ 560.*

*The sterilization process is divided into four steps:*
*1. loading*
*2. preparation, venting/evacuation of the chamber*
*3. sterilization*
*4. post-processing and drying of the sterilized product*

### *Loading the sterilization chamber*

*The material must first be thoroughly cleaned to reduce bacterial exposure to a minimum even before sterilization. It must also be pressure and heat resistant.*

*Safe, reproducible steam sterilization which can be validated is only possible if there is free access to all external and internal surfaces of the product for the steam. This involves opening containers or lab equipment and dismantling complicated instruments. Furthermore, the material may not be packed in the baskets too tightly.*

### *Venting/evacuation*

*The sterilization chamber must be completely vented before the actual sterilization process. Efficient steam sterilization can only be ensured if the steam has fully displaced the air in the chamber. There are several ways to achieve this which must be coordinated with the type of material to be sterilized. When sterilizing solids, the fractionated pre-vacuum is a tried and tested method and is predominately used in modern sterilizers. In this case, air is vacuumed out of the chamber using a vacuum pump and globe valve GEMÜ 550 and is replaced with steam. This process is repeated several times. Finally, steam is added until the required operating pressure is reached.*

### *Function of sterilization*

*If the saturated steam condenses on the sterilized material, thereby emitting energy, the protein in the cell is destroyed. It is essential that this heat is damp. While it is possible to sterilize with dry heat, considerably higher temperatures and longer exposure times are required.*

*GEMÜ 555 globe valves for pure air*

### *Drying*

*Heating is started after the chamber has been evacuated. Normally, sterilization is carried out at 121 °C for 20 minutes or at 134 °C for 5 minutes. Once this process is completed, the steam is vacuumed off and the chamber is evacuated to 120 mbar in order to dry the product. Depending on the product, drying is carried out with a drying vacuum or air pulsation. Hot air drying is only required in rare cases. Any existing condensate evaporates due to the vacuum and is discharged via the vacuum lead and seat valves GEMÜ 550. Pulsated drying, during which the air is fed into the system in phases, has proven itself to be a tried and tested method. Before discharging, the chamber is cooled and pressurized with cooling water via the sheath.*

### *GEMÜ valves used*

*GEMÜ 550 globe valves are installed in the condensate line, air line and in the refrigerant circuit. For control functions gobe valves GEMÜ 550, 554 and 555, at emptying processes ball valves GEMÜ 762 and 751 are applied; furthermore check valves GEMÜ 560, ball valves GEMÜ 740 and butterfly valves GEMÜ 488.*

*Steam states:*

- *Saturated steam (also called pressurized steam): pure steam rising from boiling water*
- *Unsaturated steam: arises when there is insufficient water, i.e. the saturated steam does not fill the total space*
- *Hot steam (also called overheated steam): arises when saturated steam continues to be heated without water.*
- *Wet steam: arises when saturated steam cools down, e.g. during a pressure reduction, and contains water particles.*
- *Steam-air mixture: arises when steams flows into an air-filled space and has a lower temperature with consistent pressure*

*GEMÜ 550 globe valve*

*GEMÜ 550 globe valves in the flow lead*

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