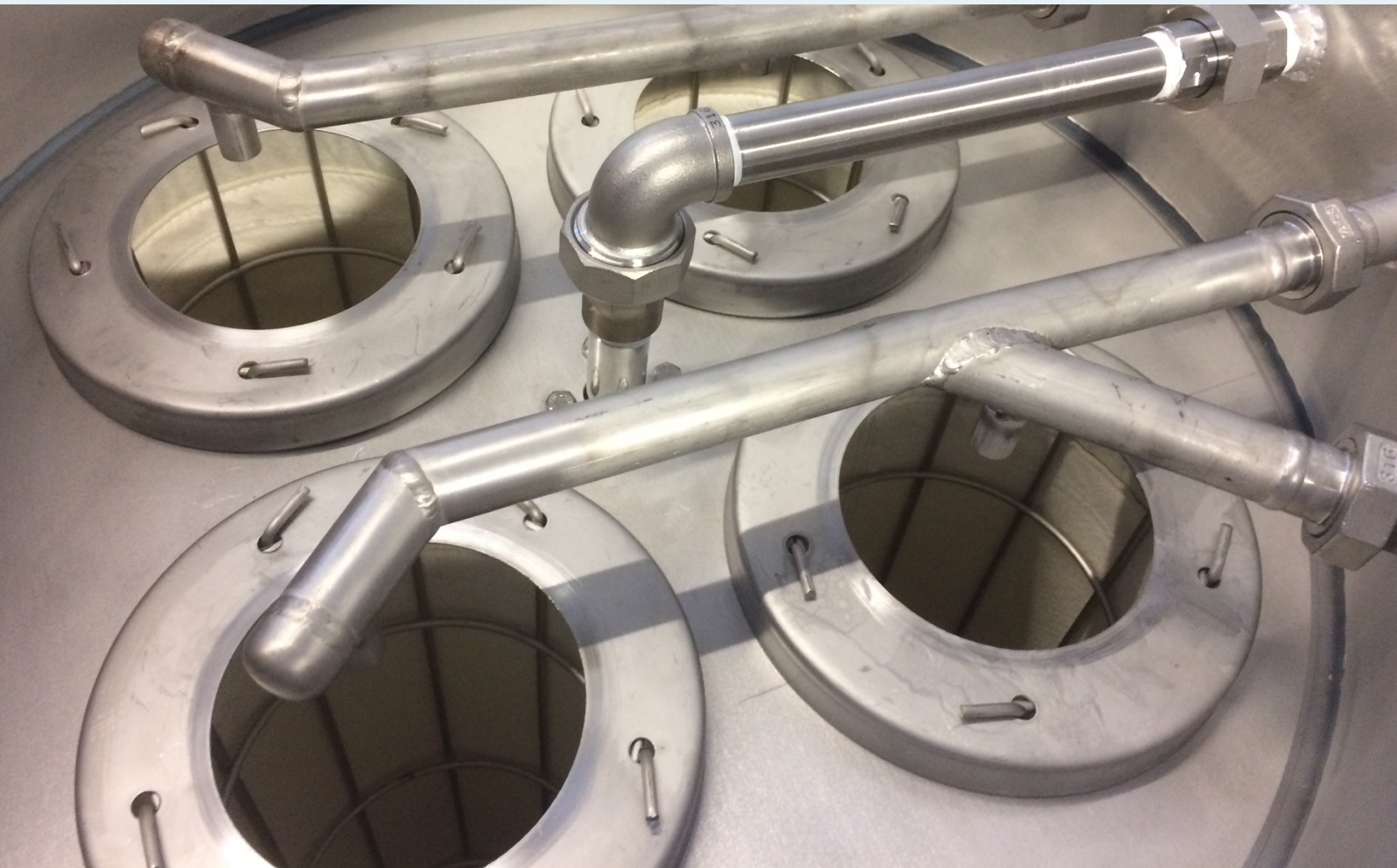


NANOPOWDER COLLECTION

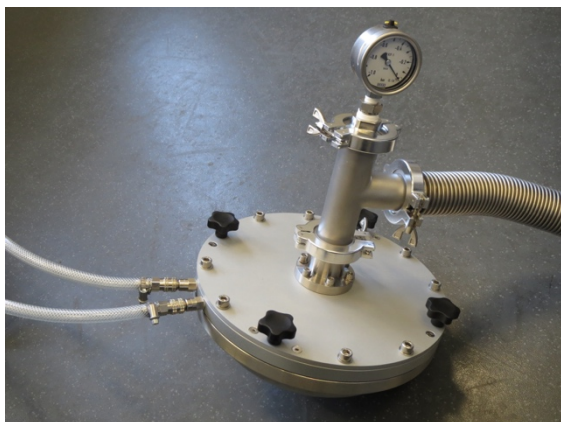


- ❑ **SAMPLING FILTERS FOR AEROSOLS**
- ❑ **SMALL-SCALE BAG-HOUSE FILTERS FOR NANOPARTICLE COLLECTION**
- ❑ **DISCHARGE AND CLEAN-IN-PLACE SYSTEMS**
- ❑ **PILOT-SCALE BAG-HOUSE FILTERS**

In 20 years dealing with nanoparticle production, we have not found a filtration system that specifically addresses the needs of nanoparticle collection at the laboratory- or pilot-scale. Thus, we have designed our own filters in order to meet the special requirements of fine particle collection in an R&D environment such as high yields, frequent product changes, easy cleaning, minimization of cross-contamination, safe powder discharge, avoidance of dust formation and uncontrolled product release.

Sampling filters

A laboratory set-up for gas-phase particle synthesis typically produces only gram quantities of product powders which need to be collected for further analysis. The ParteQ sampling filters have been designed for exactly this task.



Standard 10 inch (25.4 cm) glass-fiber surface filters are used for particle collection at aerosol temperatures up to 300°C. Filters are placed in a holder of stainless steel to minimize corrosion. The lid of the filter holder can be water-cooled to reduce the temperature at the filter and to cool the off-gas that is conveyed with a dry rotary vane vacuum pump. Standard DN40 ISO-KF vacuum flanges are used to connect the filter. Other types of flanges as well as different filter sizes are available.

Bag-house filters

For larger production rates, a semi-continuous or continuous filtration system is necessary. Bag-house filters with PTFE-coated filter bags have been proven an efficient collection system for nanoparticle production at temperatures up to 200°C. Our smallest model with four filter bags and 1 m² filtration area even fits into a chemical fume hood! Combined with our laboratory flame-spray reactor for nanoparticle production, it can provide 250g batches of nanopowder per day.



A DN40 ISO-KF vacuum flange is used for the aerosol inlet, equipped with ball valve and temperature probe, if necessary. Particles collected on the surface of the filter bags are removed periodically by a back-pulse of pressurized air or inert gas. Continuous operation is possible since only individual bags are cleaned at a time while the others remain available for filtration.

ParteQ

For powder discharge, a pneumatically-sealed butterfly valve is proposed to minimize wear on the gasket and prevent product contamination. Powders can be filled directly into plastic bags and continuous liners or into stainless steel containers. Solutions employing split-butterfly valves that are used in the pharmaceutical industry and seal both the filter and the product container for maximum containment after disconnection have already been realized, as well.

The off-gas is conveyed with a frequency-controlled centrifugal fan, allowing a constant volume flow through the system. ParteQ can also supply matching high efficiency HEPA filters for installation as safety or “police” filters downstream the main particle collector. Systems for measurement of particle concentrations are available, too.

Clean-in-place system

Minimization of dust formation and prevention of dust release into the workspace are of utmost importance for the production of nanopowders that may have unknown health effects. Therefore, the ParteQ bag-house filters can be ordered with a clean-in place (CIP) system that allows to wet the product compartment of the filter, e.g. before a product or filter bag change or for maintenance.



The CIP system is equipped with a series of static spray nozzles and a bottom rotating nozzle to wash down particles adhering to the inside walls of the filter and the filter bags. Once wet, the surfaces can undergo a manual follow-up cleaning to remove residual particles without formation and release of dust. Clean water tanks and pumps as well as waste water collection containers can be provided, as well.

Pilot-scale filters

All ParteQ bag-house filters are customized to best match the particle collection task and a range of sizes is available.



The largest bag-house filter installed in a pilot-scale flame spray pyrolysis (FSP) unit for nanoparticle manufacture operates with 70 filter bags allowing nanopowder production at up to 100 kg/day.

