

SchuF Fetterolf SchuF MultiProbe™ Valve for PAT Applications



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PAT Applications in Pharmaceutical Reactors

In recent years, there has been a significant increase in the use of Process Analytical Technology to optimize pharmaceutical and fine chemical manufacturing processes. Chemical processes can be monitored with fully immersed PAT tools such as infra-red (IR), Raman, FBRM, and PVM probes, where direct insertion into a reactor vessel is required. Reactions can be analyzed in real time with PAT tools, providing immediate data on critical process control parameters (such as reaction initiation/endpoint, reaction progression, intermediate formation, concentration, yield, etc.).

If problems arise during the reaction, the parameters can be modified before the batch is completed. The aim is therefore to reduce production cycling time and product sampling, prevent rejection of batches and to improve energy, material use and overall efficiency.

Challenges facing the Customer

A major challenge in the use of PAT is finding suitable entry points for the measuring technology into reactors. The modification of existing vessels is prohibitively expensive, requires revalidation and is sometimes not even permitted. Entry from the reactor top can also be a problem for low volume batches. SchuF has developed an innovative, cost effective solution to overcome this problem.

The SchuF PAT Solution – MultiProbe™ Reactor Bottom Outlet Valve (Patent Pending):

SchuF Fetterolf has long been the market leader in drain valves for pharmaceutical and fine chemical applications, leading the way with deadspace free, GMP compatible designs, bellows sealing to atmosphere and fire-safe certified valves. Now SchuF enables customers to incorporate PAT technology into a reactor bottom outlet valve with built-in PAT probe monitoring capabilities. The PAT probe is installed through the valve actuator, stem and disc and is directly exposed to the medium in the reactor.

The benefits of the SchuF MultiProbe™ are best summed up by one of our customers:

"Therefore this relative simple but innovative valve installation has the potential to significantly impact the business through reduced batch cycle time, improved quality and increased process robustness".

May Ling Yeow,

Pfizer Global Research & Development



Above: SchuF valve with integrated Mettler Toledo ReactIR™ FT-IR probe installed at the outlet of a reactor. The probe is connected to an online reaction-monitoring instrument.

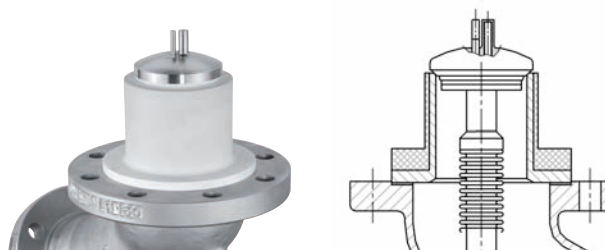
Technical Features:

SchuF's unique MultiProbe™ design (Patent Pending) ensures that the medium in the reactor does not leak through the valve stem. The PAT probe can be removed quickly between batches without the need to remove the valve from the vessel. As the PAT probe is located in the bottom part of the vessel, even low volume batches can be monitored in real-time.

Integrating PAT technology with the SchuF valve eliminates the need to modify existing reactor vessels. It is a low-cost solution, allowing the implementation of modern PAT technology in both existing and new reactors. A wide range of materials are available, including Stainless Steel, Hastelloy, Glass-Lined, PTFE-Lined and Tantalum Clad valves.

The MultiProbe Valve™ – a cost effective solution:

- No need to modify reactor vessels
- Reduced batch cycle time and product sampling
- Improved product quality
- Improved energy and material use
- Increasing process robustness
- Easy installation and maintenance



Above: Mettler Toledo ReactIR™ FT-IR probe mounted in the SchuF reactor drain valve.

The SchuF MultiProbe™ comes in two basic versions:



1. The single shaft version

- a single shaft in the valve stem to accommodate one PAT probe.

The Infra-Red PAT probe shown here incorporates a 1xPT100 temperature sensor.



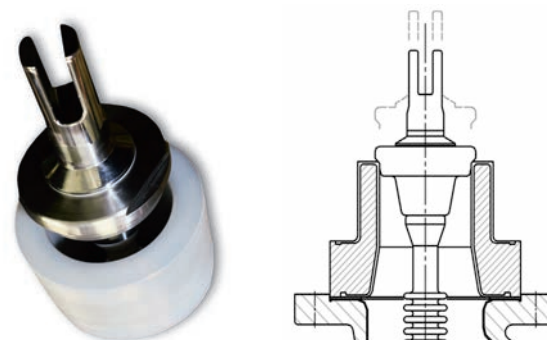
2. The dual probe version

- includes an over-sized valve stem with 2 independent shafts, one for the PAT Probe and one for a traditional 2xPT100 temperature sensor. Each instrument can be installed or removed independently of the other.

PAT + Sensor Technology

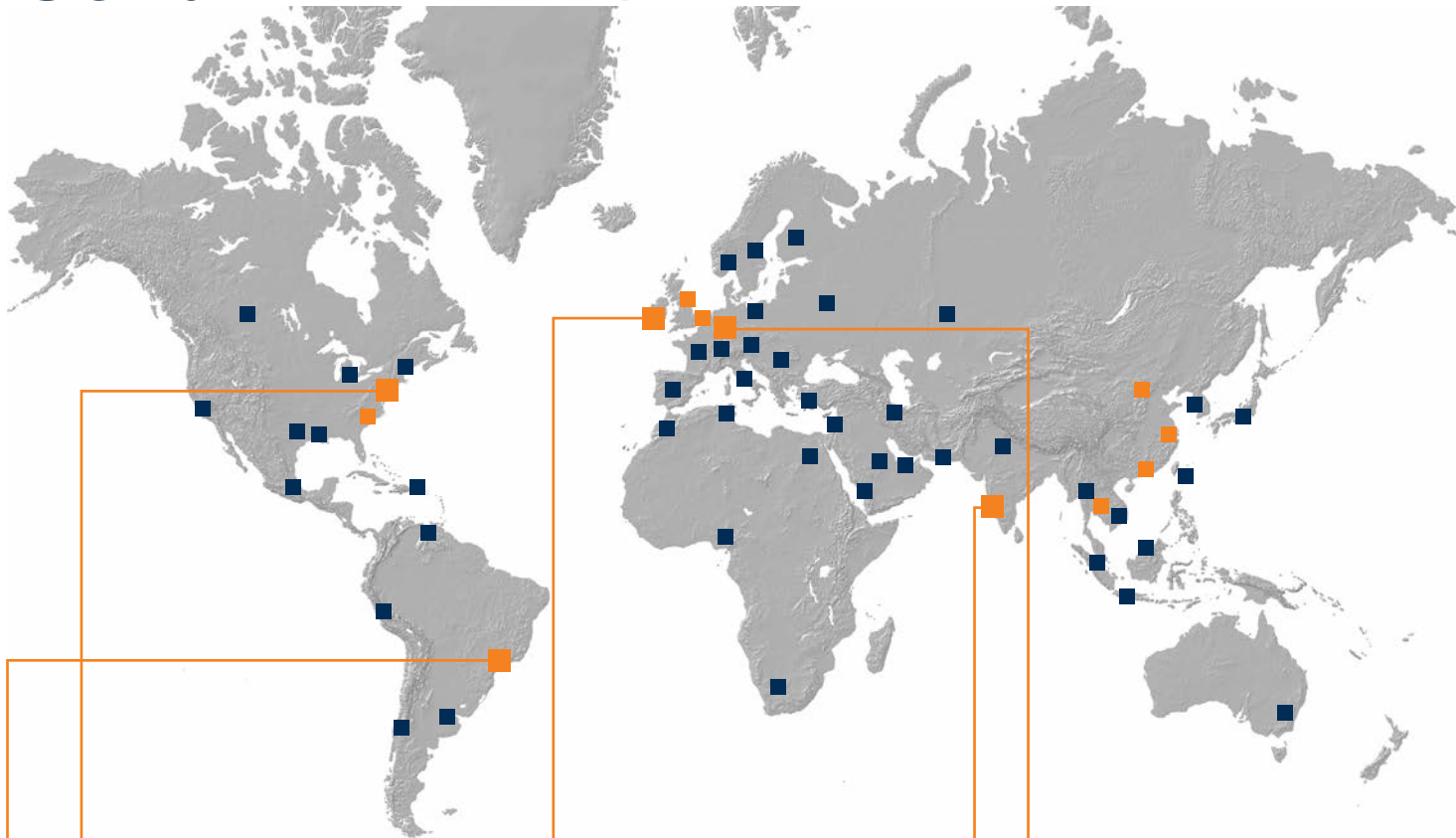
Several types of PAT probe can be accommodated in the SchuF MultiProbe™ valve. These include IR, Raman, FBRM, and PVM probes.

SchuF bottom outlet valves are now also available with LiquiSonic® probes from SensoTech which measure the absolute sonic velocity in the process liquid. The concentration or density can be calculated from this. The LiquiSonic® probe protrudes into the bottom of the reactor and is an integral part of the valve disc.



Above: LiquiSonic® probe incorporated into the SchuF reactor drain valve.

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