

Blower-crossjet for scanner optics and air-management in remote laser welding cells

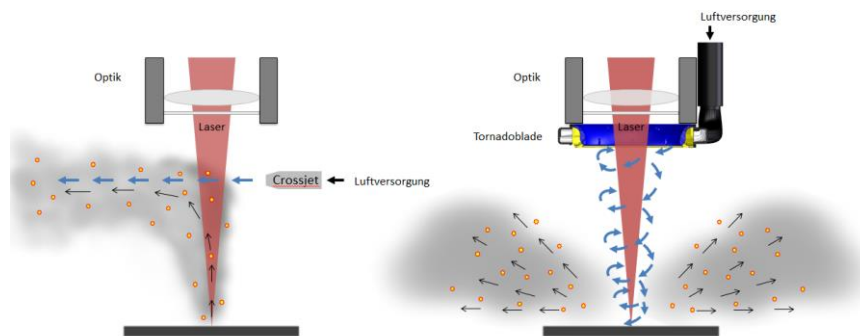
Gebälse-Crossjet für Scannerschweißoptiken und Luftmanagement in Laserstrahlschweißzellen

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Lasers are used for many applications in material processing and now represent a standard industrial tool. Especially remote laser beam welding is increasing popularity due to high dynamics and variety of advantages.

In terms of business, however, this is counteracted by high operating costs. Those consist of compressed air generation and supply of approx. 2,500 NL/min (= 150 m³/h) for crossjet operation, and protective glass consumption (approx. 90 €/pc). A novel blower crossjet "Tornadoblade®" now helps to reduce the operating costs and has positive effects on process stability. In addition, the air management within the laser cell and the clamping technology used are of crucial importance for the successful implementation of a welding task.

Conventionally, a strong air flow is arranged transversely to the laser beam, shall deflect spatters flying towards the protective glass. Due to the large focal length of the remote welding optics another challenge arises: A long "free" distance for the laser beam through the working space through which the laser beam interacts with the atmosphere (contaminated by the welding process itself). Scattering and shielding effects lead to power loss, reduce the quality of the laser beam and lead to process instabilities.



The new "Tornadoblade®", on the other hand, works with low-cost blower air. The air flow is guided to a nozzle chamber which is located directly below the welding optics, and a strong and in itself rotating air vortex is created. As a result, welding fumes and particles are removed from the laser beam path. Thus, the laser beam spreads in a relatively clean atmosphere so scattering effects are reduced. As the vortex reaches up to the workpiece it additionally takes over the direct ventilation of the weld. Metal vapors and welding spatters are blown away "outwards" directly at the point of origin, more energetic spatters are deflected to the outside so far that they can no longer reach the protective glass.

The air management of the laser welding cell is also crucial. The cleaner the cell air, the lower the downtime caused by maintenance work and the cost of wearing parts. Blower-operated air supply and exhaust air systems have proven their worth here in order to evacuate the welding fumes as quickly as possible. Many years of experience prove that the air exchange within the remote laser welding cell is difficult to control by means of selective suction devices.

Summarised, blower crossjet and well thought-out air management are process-stabilizing and directly increase the quality of the product as the influence of disruptive factors is significantly reduced. These are decisive success factors for the economic operation of laser welding systems.

The blower crossjet "Tornadoblade®" can reduce the operating costs by several thousand euros per year. Also, the complexity of the clamping tools used may be reduced in terms of integrated air or shielding gas nozzles, which means a further cost advantage in capex.