



Compact Laser Cutting Machines with Variable Table Set-up to allow Different Types of Loading

KNUTH LASER-JET cutting machines have been proven for small batch and single parts production in a wide variety of industries. Depending on the required type of loading they require minimum floor space and provide high application flexibility. A pull-out cutting table optimizes ergonomic handling, and a table changer system allows cutting of large quantities in a semi-automatic operating mode.

The **fiber laser** is becoming an **increasingly significant tool** for cutting metal sheets. This applies in particular to stainless steel, aluminum materials, and copper alloys. Due to its wavelength which is 10 times shorter than the CO₂ laser beam's wavelength, it can be focused more efficiently and is well absorbed by metallic materials. Another plus is significantly reduced maintenance which results from a robust, fully enclosed optic fiber cable between the laser resonator and the cutting head, guiding the beam without any mirror optics. Lens wear also is minimal, since easily replaceable glasses are used to protect the cutting lens from splatter and smoke particles generated during the cutting process. In addition, the fiber laser also provides significantly higher electric efficiency, resulting in lower energy cost per cut length compared to CO₂ lasers.

Compared to the 10.6 micrometer wavelength of the CO₂ laser, the fiber laser wavelength makes its beam to pass the eye lens and hence to penetrate into the eye. Therefore, it is mandatory that fiber laser cutting is performed inside an **optically sealed protective enclosure**. This type of enclosure will inherently limit access to the work area of the laser cutting system. The LASER-JET, however, has much less restrictions. In the open-system operation with a CO₂ laser, the **ergonomic design ensures fast loading** of the material plates **and easy removal** of the cut parts. This is achieved by the LASER-JET's machine bridge being orientated parallel to the long-motion axis, so that the work area is accessible on both long-sides. For the fiber laser operations, the machine frame remained unchanged, and the required protective enclosure is merely placed on top as an additional machine component. A segment door for the front opening is pulled up for loading and removal and thereby is pushed under the protective enclosure's roof. This allows unobstructed access to the work area along the entire front side. Two sliding doors at the machine rear provide easy access to the work area along the opposite side.

In this basic form, the laser cutting system requires only **minimal floor space**. The compact design of this machine also translates into the **shortest possible paths for handling**. Upon starting a cutting job at the machine-mounted control panel, the front

door automatically closes. Various sensors will check whether all other openings of the enclosures are completely closed, before the cutting process is released and started by the machine control. After completion of the cutting job, the enclosure automatically re-opens. The same applies in case of interruptions of a cutting job, which is a great advantage in the production of cut parts for smaller batches, e.g.: After cutting the first part of a small batch, a dimensional accuracy and quality check can be run on the part, so that, if necessary, the tool radius and the cutting parameters can be adjusted and fine tuned at the control panel. If the test piece fell through the cutting grid, it quickly can be recovered through a hinged flap in the lower section of the machine frame. Windows in the front door allow the user to watch the cutting process, so maladjusted cutting parameters can be immediately detected and corrected. These windows are made out of a special glass that is impenetrable by micrometer radiation, so close monitoring of the work area is possible without any danger.

The **LASER-JET with 2 kW fiber laser** is currently the most in demand KNUTH laser cutting system. It easily cuts unalloyed and low-alloyed structural steel up to a thickness of 10 mm in optimum quality. This system offers a great advantage compared to other thermal cutting processes, since structures much smaller than the sheet thickness can be cut, and the heat affected zone along the cut surfaces amounts to only a few tenth of one millimeter. Stainless steel can be cut in plate thicknesses up to 6 mm with very high cut quality. Since nitrogen is used as cutting gas, the cut surfaces will be metallic bare and the bottom cut edges are free of burr. In thin sheet metals, very high cutting speeds of more than 10 m/min can be achieved, provided elongated contour lines have to be cut. On the other hand, very complex cutting contours with sharply peaked corners and narrowest webs can be created. But even thick stainless steel sheets up to 10 mm or even 12 mm thickness can be cut with a clean cut surface. However, there will be a burr at the lower cutting edge that must be removed in an additional work step.

If even thicker material has to be cut, the LASER-JET with 3 kW fiber lasers has been proven successfully. Loading the cutting table with thicker sheets inside the protective enclosure is more cumbersome due to the heavier weight. The same applies to the removal of cut parts. To remedy this issue, the LASER-JET is equipped with a **pull-out cutting table**. A two-piece support frame is set up in front of the cutting system, and the table is pulled out onto this support frame manually. In this position, heavy sheets can be loaded onto the table using a rotary crane or overhead lifting equipment. The user can walk between both side elements of the support frame for an easy manual pushing or pulling the table into or out of the cutting system.

Pneumatically operated snapping mechanisms ensure that the table reaches the correct end position within the cutting system and that it is fixed in its loading position. The guideways in the transitional area between cutting system and support frame can be folded in. This allows the user to **walk all the way around the cutting table** while loading new sheets or removing finished cut parts. The result is a significantly simplified loading process as an **ergonomic handling**. At the same time, the cutting system is accessible along its entire front length allowing unobstructed setup and maintenance.

For automated changer table operation, the two-piece support frame is removed and is replaced by a motorized lift and push system, and a second roll-able cutting table is added: Lift system for adjusting the levels of the two-table port with the cutting table level in the laser cutting system; push system for pushing and pulling the cutting table into or out from the cutting system. After completion of each table exchange the guideways in the transition area will be folded in, so that the user can walk completely around the cutting table that is outside the cutting system. If the user pushes the "Loading Complete" button at the table changer, the machine control will automatically initiate the table exchange as soon as the cutting job on the internal cutting table is finished. Any LASER-JET version with pull-out cutting table can be retrofitted with this table changer option lateron.

The compact laser cutting system is available in two versions, the **LASER-JET 1512** and the **LASER-JET 2512** with a work surface of 1500 mm x 1250 mm or 2500 mm x 1250 mm, respectively. Optionally, the LASER-JET can be equipped with a rotary device for cutting round or square tubes. This device can be hung inside the work space. It can be used to machine tubes in length up to 1 m or 2 m. For larger plate sizes, we recommend the **LASER-JET HD** Series. The LASER-JET is part of a large family of cutting systems offered by KNUTH Machine Tools, including: Laser Cutting Systems with fiber laser as well as with CO₂ lasers, Water-Jet Cutting Systems, and Plasma Cutting Systems.

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Captions:

Image 1

Laser Cutting System LASER-JET 2512 FL 2000: Compact complete system for flexible use with protective enclosure for fiber laser cutting on top, shown with closed front door during the cutting process

(Image: KNUTH Machine Tools)

Image 2

Laser-cut flange rings made of 10 mm thick mild steel, with bores of 5 mm diameter.

(Image: KNUTH Machine Tools)

Image 3

Cut stainless steel parts of 2 mm thickness: high cut quality and complex contours.

(Image: KNUTH Machine Tools)

Image 4

Cut stainless steel parts: superior cut quality in 1 mm thin sheet metal and clean cut in case of 8 mm thickness.

(Image: KNUTH Machine Tools)

Image 5

LASER-JET cutting system with front-mounted support frame for pulling out the cutting table, shown with pulled up front door for loading

(Image: KNUTH Machine Tools)

Image 6

Pulled-out cutting table on top of the support frame, where the user can walk completely around for loading

(Image: KNUTH Machine Tools)

Image 1



Image 2



Image 3



Image 4



Image 5



Image 6

