



## Precisely Cut - Keenly Costed

### Tailor-Made Compact Laser Cutting Machines for Small and Medium-Sized Companies

Automatic production in small and medium-sized companies is characterized by small lot sizes and a high part diversity. Consequently, it is very important, particularly in this market sector, that the performance and scope of functions of the laser machines and CNC controls used for more rational processing be matched precisely to the customer requirements. This is the only way of developing machine solutions which will be accepted by the end customer owing to their convenience, flexibility and real price-performance ratio.

### High Tech from Barleben, Germany

LTN Lasertechnik Nord GmbH in Barleben, Germany, was founded in August 2000 and has specialized in development and production of laser machine tools for machining an extremely wide variety of cut parts made of metal, ceramic material, plexiglass and plastic. LTN's customers are largely small to medium-sized manufacturing businesses with whom the company, working in close cooperation, develops modular-structure, high-performance machines which are not top-heavy with expensive machine or control-engineering options.

### LC 2513 M Laser Cutting Machine

The most recent example of this is the LC 2513 M laser cutting machine which was developed specifically for cutting large-area workpieces with a working range of 2500 x 1250 mm. The three-axis machine is a highly dynamic system of hybrid design which can be used as a universal stand-alone machine. It is offered with CO<sub>2</sub> lasers of power category 600 to 2000 W. CO<sub>2</sub> lasers have proven to be a particularly reliable tool with diverse application options, specifically for cutting sheet metal. The notable characteristics include high separating accuracy and high cutting surface quality. With the focussed laser beam, it is possible to produce very small contours and openings and very narrow radii. With the lasers offers, the LC 2513 M is suitable for cutting material thicknesses ranging from 1 to 10 mm in the case of sheet metal and 1 to 4 mm in the case of stainless steel sheets with a positioning accuracy of < 0.3 mm.



The LTN LC2513

The machine consists of a low-vibration baseframe, the guides with the drives for the table which traverses in the Y direction with integrated small-part discharge unit, the stationary cross-member with guides and drives for the X movement of the vertically arranged cutting head which is controlled by a closed loop as the Z axis by capacitive sampling.



### Matching the Technical Features of the Machine to the Customer Requirements

The modular structure allows implementation of solutions in line with the specific customer requirements. Both the laser resonator with the encapsulated beam guidance system and the control system with the drives and the supply units for the laser are integrated in the machine baseframe. This compact design allows space-saving installation and avoids the need for additional space for separate control cubicles.

The full encapsulation of the machine work area enhances work safety for the operator and ensures convenient access for maintenance and servicing.

### Tried and Tested, Ergonomic Control Engineering

The sturdy CNC control of Messrs. ECKELMANN, Wiesbaden, Germany which has been particularly well tried and tested in industrial environments serves as the control platform for the LC 2513 M. The powerful NC operating system of this continuous path control system for up to 12 axes covers all machining methods in laser machining. The integrated PLC allows free programming of the application-dependent machine functions in accordance with IEC 61131-3. The system is operated by means of specifically designed LCD operating terminals or a PC-compatible, full-graphic operator-control unit running under Windows 9x/2000/NT.



ECKELMANN now offers these CNC controls on three different hardware platforms. As a classic CNC, as in the case of the LC 2513 M, as a PC-based slot CNC with PCI bus interface and as a powerful DIN rail CNC. The intuitive, easy-to-learn operation in all CNC operating modes, even for inexperienced operators, is common to all control solutions. Lasertechnik Nord GmbH holds training courses in programming, control and operation of the entire machine for familiarizing operating personnel.

ECKELMANN CNC operator interface

### Control-Engineering Requirements for Sheet Metalworking

Typical effects which may impair the constancy of the cutting conditions and, thus, may reduce the cutting quality occur when laser-cutting sheet metal. Two problems in particular must be coped with by special control hardware and software functions:

1. Owing to the inevitable undulation of the sheets and distortion during machining, the distance between workpiece surface and laser focus changes. In order to maintain a constant laser beam geometry in the cutting area nevertheless, such height differences must be compensated for automatically by fast correction of the Z-axis position.
2. In order to produce a precisely defined cutting kerf of optimum and constant quality, it is necessary, in particular, to ensure that the energy per unit of length output by the laser remains constant. In the case of a variable machining speed, as necessarily occurs when cutting complex and fine geometries, it is thus necessary to control the laser power continuously as a function of the relevant tool path feedrate.



### Constant Cutting Quality Thanks to Control Intelligence

In order to compensate for the described interference factors by control methods, ECKELMANN has added special geometrical and technological functions to its tried and tested CNC module:

#### 1. Programmable proximity control

This function maintains the distance between tool and workpiece constant, even in the case of inhomogeneous surfaces, during the entire working process. This necessitates a measured value channel for detecting the distance between tool and workpiece as an analog input signal. In the case of the LC 2513 M, displacement measurement without physical contact is conducted by a capacitive ring sensor which supplies an analog signal proportional to the distance. In the case of other materials, incremental scanning by a displacement measuring system configured as a measurement axis may be used.

#### 2. Speed-dependent laser control

This function allows the laser power to be controlled as a function of the current tool path feedrate. For this purpose, the ECKELMANN control features an analog output which supplies a voltage value between 0 and 10 V proportional to the tool path feedrate. Alternatively, a PWM output is also available. The reference speed at which a value of 10 V is reached can be freely programmed. The time resolution of this output corresponds to the interpolation cycle of the control. The value is around 2 ms for the LC 2513 M control. However, solutions with higher interpolation frequency are available for more time-critical applications.

With technological competence, creativity and proximity to the end customer and operator, Lasertechnik Nord GmbH, together with ECKELMANN, its control partner, relies on sophisticated product development for rational use of laser cutting machines in medium-sized production plants, and will also do so in the future.



Operating panel of the LTN MC2513