

Laser Line Quality Control



Laser system for quality control of cutting and drilling on laser cutting machines

The LDV system is a laser device that makes automatic and certain the control of the presence of holes and cuts made by Laser machines on 3D and 2D sheet metal parts, the control is performed in less than 1 second.

The system projects points and lines on the position of the holes and cuts made on the cut and drilled stringers, at this point the dynamic control part will be able to signal the presence or absence of the processes. The operating principle is simple and can guarantee the infallibility of the system.

The LDV laser system was developed to self-control through redundancy systems to avoid signaling errors and make the quality of the control total, reporting in real time any internal malfunction.

The system is equipped with a micro PC that, in addition to recording each work cycle, can photograph and catalogue the machined parts, creating a report and also reporting which area has not been machined.

The remote assistance function is also provided where a remote operator can control the functionality of the system, reprogram the control masks and ensure continuity of work

Procedures and Operation

A series of LSF ATP lasers are provided on the machine. Cutting diagonally with respect to the position of the beam fixed on the cutting template so as to completely cover the 4 vertical sides of the beam. The specific drilling recipes for each beam are stored via a joystick/keyboard. At this point each stored laser beam must enter the hole/cut made by the laser machine so that, if there is a hole, it is not illuminated and the area is "dark".

Automatic control: in this condition, the appropriately mounted and programmed cameras will only display the area of the drilling/cutting, and if all the references are "dark" the camera will confirm "nothing abnormal", alternatively, if there is laser light in the area, they will give an alarm or whatever is required.

SYSTEM COMPONENTS

N° 2 LSF 13 laser projectors with air pressure optics cooling and cleaning system

N° 2 HD cameras with air pressure optics cooling and cleaning system

N° 1 LSF Manager software for programming and calibration

N° 1 LSF User software for fixture insertion and control

N° 1 M12 12 cable series for power supplies

N° 1 Bluetooth keyboard

LSF 13 LDV

The LSF LDV 3D Projector laser system is a 532nm 1mW galvanometric laser projector.

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Components

- Power supply 24Vdc 900mA
- 1 Laser diode 1mW 532nm with TTL driver
- 1 RJ45 LAN connector
- M12 4-pole connector
- driver board
- RLI control board
- Integrated PC
- LSF Manager Assist software
- Galvo Kit pp60Kk x/y/z 3d
- Laser Diode Ktp 532nm 1 mW Motorized dynamic focal length
- Compressed air optics cooling and cleaning system
- Remote control software system for circuit redundancy
- Voltage stabilizer

Functions

The LSF LDV laser system is connected to the external PC via RJ45 LAN cable and via I/O signal cable, this is controlled via LSF manager software that downloads the projection data to the PC and consequently to the LSF manager assist software that stores up to 1600 image files. ILD and extracted on request the LSF 13 LDV laser projector on command creates a point cloud or a series of segments, lines, arcs and points exactly on the required position in the desired time to ensure that the acquisition system detects the presence or absence of the drilled piece.

LSF VIDEO MANAGER Camera

Components

- 8MP HD Camera
- Lens
- Lan connection
- Interference filter
- Video manager assist by RLI software
- Armored aluminum case
- Optical filter

Functions

The LSF video Manager camera has the function of acquiring the data projected by the laser on the part, processing them and sending them to the video manager software that will re-process all the data and calculate all the differences (discrimination) compared to a standard processing, subsequently all the data will be reported to the dedicated software.

Operating conditions and guarantees

- Absolute rotating bench position (during Laser control) $\pm 0.5\text{mm}$
- Absolute rotating bench positioning repeatability
- Absence of vibrations and movements on the support structure
- Processes carried out by the laser in absolute position with respect to a reference template
- Check surface under the black / matt grey beam (floor)
- Fixed locking clamps on the beam during control

Technical characteristics and system performance

- No. 1600 storable images of the right and left beams
- Max. control times 1"
- Laser machine / system interface: digital I/O
- Class 1 laser (Not dangerous for eyes or skin)

Laser Machine – RLaser interface considerations

CURRENT SITUATION

- 1) Electrical and pneumatic part integrated into the machine ducts
- 2) Box for powering Rlaser devices positioned inside the machine
- 3) Adoption of LED lamps to allow switches on/off during survey, controlled by machine PLC. Requires a solid state relay. The v4 version machines (latest) are already set up with lamps and relays, but require the purchase of the option. On the others it is required. Activity similar to that performed on the prototype machine.
- 4) Application resident on the machine PC and integrated visualization in the machine HMI

Therefore the constraints to overcome are:

Internal lighting Control from internal machine PLC and lamp types

Rlaser integration. Use machine HW and visualization within the machine HMI.

ALTERNATIVE HYPOTHESES

SW Management

Hypothesis of providing separate HW on which the RLASER application resides and presents the test result.

This implies that a wired interface must be available that interacts with the machine.

End of program signal that starts the test, feedback signal to the machine that indicates the positive or negative result.

Internal lighting management

Switching off the lamps remains a constraint to take the measurement, you need to go back to the current management and therefore you need to:

- Adopt LED lamps

- Replace the relay that drives them
 - Request similar management from the machine PLC
- The customer should ask for information for a machine lighting retrofit and management update.

In another way

Insert 24 v LED lamps that can be driven by the R-laser laser system

Management of electrical passages,

You need to agree on the implementation, if they are equipped with an internal maintenance team

You need to set up a BOX that contains the power supply part of the devices to be positioned inside the cabin or outside

Pneumatics

No longer necessary

Possible benefits

- Industry 4.0 for this instrumentation a 20% tax credit is foreseen
- Industry 5.0 the system is approved but not yet accredited