

**LARGE FORMAT  
DIGITAL GLASS PRINTING**

LPKF NOVAPRINT



**LPKF**  
Laser & Electronics

# LASER TRANSFER PRINTING (LTP)

## AN LPKF INNOVATION

The LPKF Laser Transfer Printing (LTP) process is a laser-based technique with which ceramic pigments can be applied in the original screen printing size. The technique uses an endless belt as a carrier for the ink. The laser beam transfers a precisely defined amount of ink to a flat substrate. The ink carrier belt is transparent for the laser wavelength used. The laser beam is focused on the ink and vaporizes a portion of the solvent. This creates an expanding vapor bubble, which pushes an ink droplet towards the substrate. The ink droplet detaches and settles on the substrate.

The laser focus is guided in the form of a line along the carrier belt. The continuous motion of the print head relative to the substrate generates a printed image – line by line. Through switching of the laser on and off during the scanning, an image finally arises.

The laser energy employed determines the amount of ink transferred and allows for control of the thickness of the ink layer on the substrate.

### LTP Process: Droplet Flight



The laser hits the ink-coated plastic belt and vaporizes portions of the solvent



The vapor bubble expands and forms a droplet



The detached droplet settles precisely on the substrate

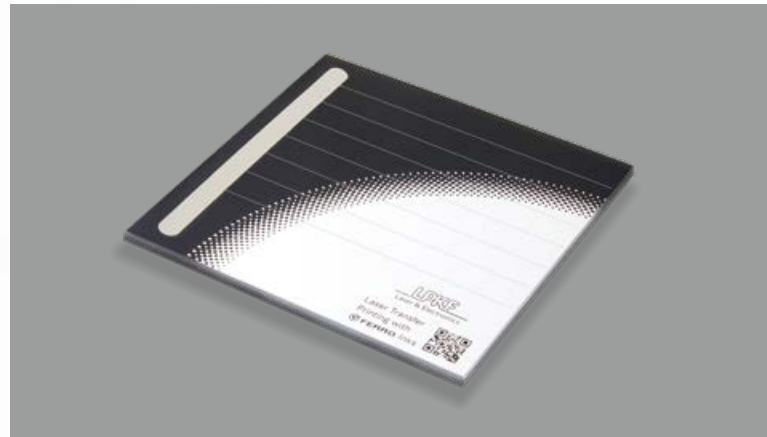


Railway glass printed using the LTP process

## Printing With Certified Inks

A key feature of LTP is the adaptation of the original screen printing pastes for the laser transfer process. Compared with the original screen printing paste, only the medium is changed to yield an LTP-compatible ink.

The inorganic part of the ink remains untouched. Thus, after firing, the resulting print on the glass substrate is identical in terms of quality and physical/chemical properties to that obtained through screen printing.



- **Logo printing**
- **Printing of QR & data matrix codes**
- **Fine line printing**
- **Prints with variable layer thickness**
- **Exact printing of silver on black (dry)**

With the LTP technique, black borders and motif prints as well as serialized logos, serial numbers, and QR and data matrix codes can be printed on flat glass using original screen printing pastes.

Precise printing of antennas, windshield defroster grids, and soldering points is possible with fine line printing. The laser power can be varied in the process so that the amount of ink transferred is adapted, enabling, e.g., resistance adjustments to be possible without the need to change the ink.

With the LTP technique, multiple printing passes with no prior drying and thus layer thickness buildup in specific areas are possible.



- **Digital technique**
- **Flexible glass sizes and layouts**
- **Precise printing**
- **User-friendly operation**
- **Easy glass-to-glass serialization**

## **LPKF NOVAPRINT**

# SYSTEM OVERVIEW

The LPKF NovaPrint was specially developed for printing of glass for passenger vehicles, buses, trains, planes, and ships. The printer is equipped with fast gantry-style linear axes. The axis system can hold at least one print head. The glass referencing system is camera-based and can be used flexibly for any glass model without any mechanical setup.

The elaborate and cost-intensive installation of new screens is done away with. Cleaning, reordering, and storage of screens are no longer necessary. The heart of the LPKF NovaPrint is a high-speed print head. The main components of this print head are the inking unit, a line scanner, and the laser unit.

In the inking unit, a rotating endless belt is coated continuously and evenly with the printing ink. The laser beam focal point is moved extremely rapidly over the belt, thereby initiating the actual transfer process.

### **Digital Technique**

Traceability from glass to glass with original certified ink. With LTP printing, characteristics such as serial numbers or QR codes can be modified and printed simply via a mouse click.



The LPKF NovaPrint is a standalone printer. It can be used as an offline system or integrated into production lines.

## Flexibility

The LPKF NovaPrint is the optimal solution for small and medium lot sizes and high design variability. There are no setup times and no more need for large screen stores. However, all of the mentioned advantages are retained.

## Certified Inks

The possibility of printing with original screen printing pastes with the LPKF NovaPrint avoids complex qualification measures. With LTP, the properties of the fired pastes and inks are retained.

LPKF NOVAPRINT	
<b>Machine</b>	
Print head nozzle-less	Single print method
Continuous wave laser	10 Watt – 200 Watt
Wavelength	1070 nm
Print resolution	1200 x 600 DPI
Print speed	250 mm/s; 15m/min
Cycle time glass to glass	300 mm x 300 mm → 33 s 1200 mm x 800 mm → 84 s
Glasses per hour	300 mm x 300 mm → 109 pieces 1200 mm x 800 mm → 43 pieces
Automated glass detection	Camera-based multi point capture (2 points per edge)
Glass sizes	300 mm x 300 mm – 2000 mm x 3000 mm
Glass thickness	1 mm – 8 mm
Temperature control	2 air conditioners in the cabin
Cleaning effort	Paint-tub, ribbon approx. 15 min due to colour changing or after 8 h downtime.
Power consumption	10 kW
Weight	7500 kg
<b>Printing Inks</b>	
Layer thickness single pass	10 µm – 60 µm
Line width	> 100 µm
Particle size	< 40 µm
Solids content	< 80 %
Ink droplet size	80 µm – 200 µm
Drop to drop distance on substrate	> 100 µm
Ink consumption	Full surface black at OD 3 After firing: 18 µm LTP printed (wet): 32 µm (comparison data screen print (wet): 24 µm)
Ink	Ferro black/silver or other supplier
<b>Software</b>	
<b>LPKF PrintMaster Edit</b>	
Data Import	DXF, TIFF
Pre-press	CAD-based layout creation or adaptation of imported data
Serialisation	Automatic generation of QR codes, data-matrix, serial numbers
Font selection	Windows fonts
Data export to machine	LPKF RIP format: CP2D
Data transfer	MES, USB, ethernet
<b>LPKF PrintMaster Machine</b>	
Flexible production	Variable glass sizes, shapes, layouts
Batch processing	Automatic job processing
Statistics function	Display and save production-relevant data
<b>Optionales Zubehör</b>	
External ink supply	1 – 2 tanks with 25 litres each
Conveyor	Standalone or inline system

# LPKF PRINTMASTER

## IDEAL FOR DIGITAL PRODUCTION



LPKF PrintMaster was specifically developed to meet the needs of customers in industrial printing. The print data can be easily imported or created via the wide range of CAD functions. LPKF PrintMaster is easy to use and harmonizes perfectly with the machine hardware.

### Batch Processing for Flexible Production

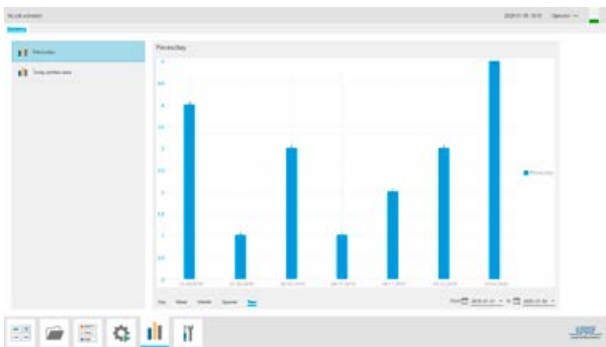
The daily output is loaded into PrintMaster in the desired order before production starts. The batches are then automatically processed.

### Statistics Functions

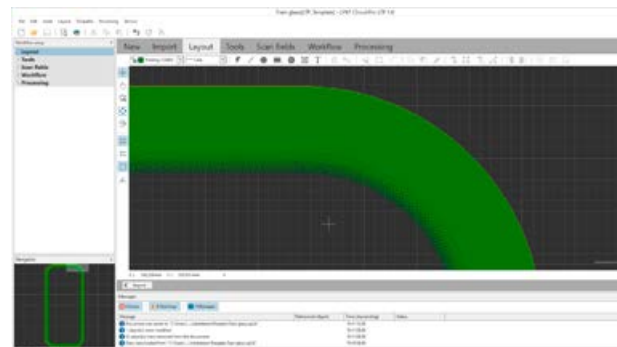
Evaluation of production parameters such as ink consumption, printed area, or number of units.

### LPKF PrintMaster Edit – From Idea to Glass

- Import of DXF print data and preparation for printing process
- CAD design module for creation of print data
- Internal raster image process
- Creation of dynamic print data (serial numbers, QR codes)



Statistical analysis of production



CAD design of print data

# COMPARISON OF PRINTING TECHNIQUES

## WHY LASER TRANSFER PRINTING?

### Screen Printing Technique



### Laser Transfer Printing



Laser Transfer Printing allows for a significant reduction in the number of process steps required and thus cost savings.

## YOUR ADVANTAGES



### Productivity

- Cost-effective due to low personnel costs
- No setup times
- No costs for storing screens



### Market

- Increase in competitiveness due to fast response to market changes
- Flexible and fast technology
- New designs can be rapidly implemented
- Special projects possible



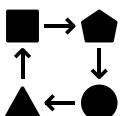
### Flexibility

- Handling of small lot sizes and high design variability
- Efficient prototyping possible



### Your Partner LPKF

- Worldwide sales and service network
- Technology and application center for prototyping, process development, and application consulting



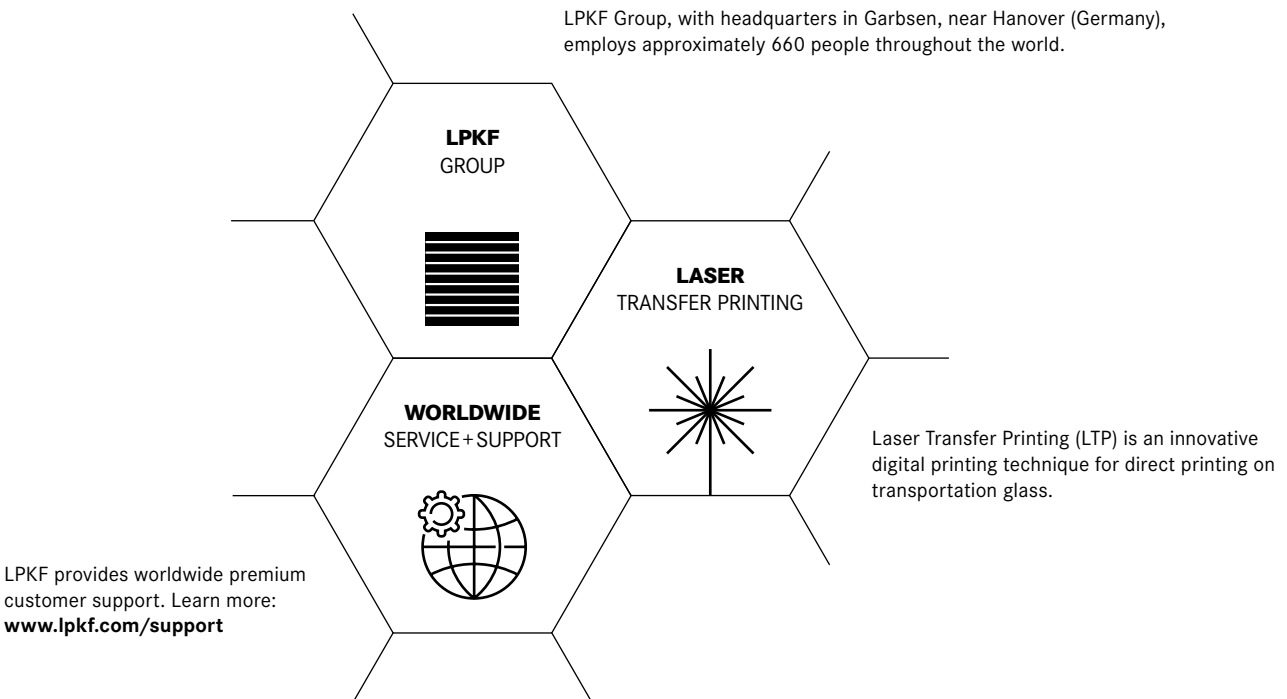
### Individualization

- Processing of variable data
- Printing of serial numbers as well as QR and data matrix codes
- Individualization possible at any time

LPKF Laser & Electronics AG develops, builds, and delivers laser systems for electronics, photovoltaics, and the automotive industry. For this, laser, control, and drive technology know-how is supplemented with extensive micromachining knowledge.

LPKF provides a reliable support structure through service centers. Highly qualified and specially trained LPKF service personnel are available worldwide around the clock for system startups and servicing tasks. 24/7 service and support goes without saying for LPKF.

The LPKF Laser Transfer Printing (LTP) process combines the accuracy and flexibility of a laser-based digital printing technique with the ability to print certified black and silver colors known from screen printing on automotive glass. This opens up new possibilities such as digital printing of logos as well as data matrix and QR codes. Also in the aftermarket or for low-volume production, e.g., for transportation glass, LTP makes screens in production obsolete.



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