

Metallograph[®] Industrial Flexible Electronics Printing

Gerber Edge-based System

Introduction

Critical factors for industrial printing of Flexible Electronics include high dimensional accuracy, extended reliability, dependable productivity, all at a width that matches common assembly and finishing lines. Furthermore, the development of the market has been greatly hindered by the very high capital and operating costs, and extended start up times for the existing printing systems, screen, flex and inkjet using on nanoparticle inks. ROI for too many installations is well below target.

The critical requirements however, can be met with capital costs an order of magnitude lower with off the shelf technology. The keys are Gerber Scientific Edge 300 mm thermal transfer printers and Metallograph[®] continuous transfer ribbons for conductors and dielectrics – there is no extra system cost for multilayer structures.

Gerber Edge FX Printing Systems

A Gerber Edge printing system consists minimally of the printer and software combination, unwind, substrate and ribbon. Graphic arts printing and printer maintenance is supported globally by the Gerber dealer network. Metallograph printing is a little different in that a precisely aligned winder and rewind are absolutely necessary, and Gerber's range of substrates useful for electronics is limited.

However, Graphic Marking Systems (GMS), one of Gerber's technically strongest dealers, has been supporting the electronics industry for years with an extended range of films, technical expertise and its own design ancillary equipment. SPF-Inc is pleased to have GMS as its preferred source of Gerber production systems and supplies.



The Edge Printer

The Edge prints single or multilayer to 11.8 inches wide using a fixed 300 dpi printhead and thermal transfer ribbons. The standard mode is roll-to-roll mode. Pixel dimensions in the print dimension can be 300, 600 or 1200 per inch, enabling a higher capability for structure such as resonators requiring very specific lengths. Image dimensional precision, whether single or multiple layer, is assured with a tractor drive and edge-punched substrates. For volume production and more consistent registration, GMS designed and assemble an alignment frame on which the printer suits. It is also the mount for the reversible unwind/winders.

Metallograph®

Printed Electronics Tech



Gerber Edge FX on GMS Alignment frame with unwind/rewinder

As the photograph above shows, only a short length of film is exposed to room dust, and it can be covered very readily with clear plastic boxes each side. In this configuration precision of overprinting is usually $< \pm 0.001$ inches. By alternating Metallograph® conductive and dielectric ribbons, complex circuits with conductive bridges only a few microns thick can be assembled without removing the substrate from the machine until complete. The last pass may also be a standard ribbon to print part numbers, alignment marks, instructions and logos, matching standard PCB nomenclatures.

The image precision transfers to downstream processing using a combination of registration marks and the uniquely patterned side punch. Gerber's enVision® cutter uses the original design file to cut substrate in layers from front or back, or completely through all layers.



Both printer and cutter with their own unwinds/rewinds, can operate unattended, except for ribbon or roll changes.

While the printer can be operated in-line with other processes, its fixed speed requires it to be the master, and so it is usually run independently, even of simple devices like laminators.

Processes:

The following are processes coupled with Edge printers.

1. Laminators on the print side for physical and chemical protection, electrical insulation, etc.

2. Laminators to rear full width or with patterned adhesives in register with the print.
3. Cutters for parts or label-like structures on the image side.
4. Cutters on the back side to expose under-layers for complex structure assembly.
5. Screen printers for electrically functional inks (PEDOT-PSST), adhesives etc.
6. Pick and place for components mounted with, for example, thermoset adhesives.

Based on our experience with this market and the available technologies we frequently recommend the Edge to our industrial customers. And we can lay out lines with printing, cutting, laminating and other film processing stems. It is preferred of course, that customer first defines the function of the installation and production expectations. Every job is unique so we adapt to customer needs.

Procurement for Metallograph

Even though Edge software, printers, cutters and graphic arts supplies, can be purchased from any authorized Gerber dealer, we believe that printed electronics users will be better served by producing a bundled system, along with the specific training and technical service directly from GMS. The pre-shipment check will be with Metallograph[®] conductive ribbon on film suitable for printed electronics. Package deals are based on the Gerber Edge FX, and include the full factory warranty, and access to factory support.

GMS and other dealers post prices for supplies, systems and packages on-line.

Older Gerber Edge Models

The older model Edge 2 in good condition (especially with a printhead free of flaws) is recognized as an industry workhorse. We have produced hundreds of prototype circuits and structures on these. There is no warranty however, and some parts are no longer available. But for those companies who have one, getting started is little more than buying ribbon and substrate.

More Information

Gerber Scientific:

Edge FX Printer: [Web page](#)
enVision Cutter: [Web page](#)
Omega Software: [Web Page](#)

Graphic Marking Systems:

Gerber Authorized Dealer: [Web page](#)
GMS: [YouTube Channel and videos](#)
GMS Rewinder: [Webpage](#)
Gerber Brand Substrates: [Web page](#)
Special Media: info@graphicms.com

Example Metallograph Gerber Edge Production System

The following is an example for a print system for single and multi-layer printing of substrate to be taken directly in roll form, or after sheeting, in sheet form, to other processes.

Purpose

Development and production of Metallograph[®] conductive aluminum flexible electronics on polyester or polycarbonate films, with dimensions 12 in. (300 mm) wide, and to 13 ft. (4 m) long. Minimum conductor width is 0.010 in. (250 μ m). Minimum gap between conductors is 0.010 in. (250 μ m). Printed rolls suitable for processing by screen printing, laminating, die attach, die cutting, & sheeting.

Printing & Cutting System Components

1. Gerber Edge FX thermal transfer printer (300 mm print width)
2. Automated controlled tension winder and rewinder plus support frame for the printer
3. Computer: Customer supplied per requirements from Dealer
4. Printer software for processing and printing files generated separately by engineering or graphic arts programs.
5. Gerber Envision 375 digital cutter.
6. Automated controlled tension winder and rewinder plus support frame for the cutter

Supplies

1. Metallograph Ribbons
2. Pre-punched substrates
 - a. e.g., Gerber EDGE READY Clear PET Label Stock p/n P59879A

Training

Who: A small number of engineers and production technicians.

What:

- a. Operation, routine maintenance & basic trouble shooting for printing and cutting
- b. Printing Metallograph

Where: At customer site – concurrent with set up.

Trainer: Edge seller

System Bundle Pricing

Primarily from Graphic Marking Systems (GMS) website. Contact GMS for Bundle Pricing, Metallograph[®] Ribbon and Gerber Edge Ready and Special FPE Substrates.

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Metallograph Technology and Markets

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